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Xu et al.

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(54) **NETWORK SLICING WITH RADIO ACCESS NETWORK (RAN) SHARING**

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H04W 84/04 (2009.01)

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CPC H04W 48/18; H04W 48/16; H04W 84/042
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2018/0310238 A1 10/2018 Opsenica et al.
2018/0324602 A1 11/2018 Griot et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 109951877 A 6/2019
WO WO 2020/098954 A1 5/2020

OTHER PUBLICATIONS

International Search Report and Written Opinion of the International Searching Authority directed to related International Patent Application No. PCT/CN2021/071386, mailed Oct. 14, 2021; 9 pages.
(Continued)

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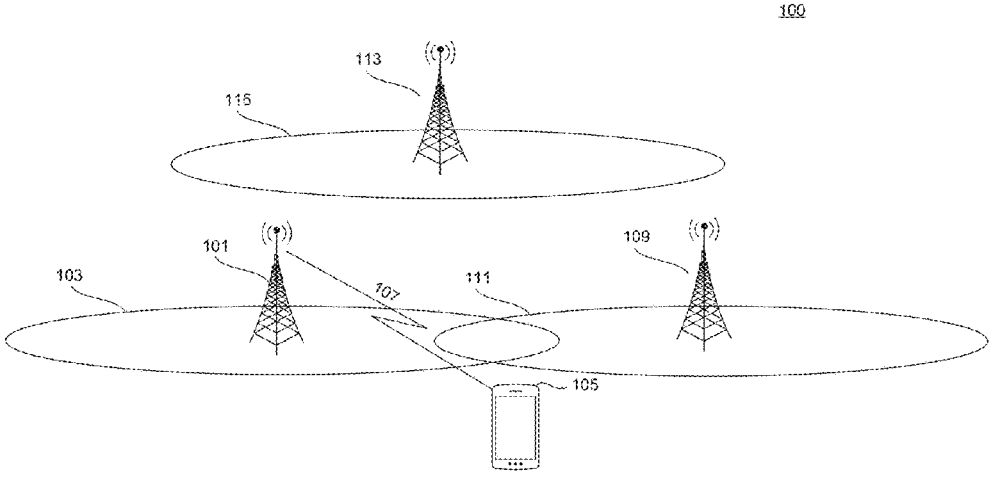
(57) **ABSTRACT**

An approach is described for a base station to generate a first message and a second message. The base station transmits the first message and the second message to a user equipment (UE). The first message is associated with a cell supported by the base station and includes a first public land mobile network (PLMN) identity index and a first list of one or more network slices supported by a first PLMN associated with the first PLMN identity index. The second message is associated with one or more neighboring cells, and includes the first PLMN identity index and a second list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells. In addition,
(Continued)



at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data.

20 Claims, 10 Drawing Sheets

(56) **References Cited**

U.S. PATENT DOCUMENTS

2019/0380128	A1*	12/2019	Park	H04W 72/29
2020/0163149	A1*	5/2020	Mildh	H04W 36/36
2020/0305054	A1*	9/2020	Zee	H04W 36/0061
2020/0322879	A1	10/2020	Zhu et al.	
2022/0053416	A1*	2/2022	Salkintzis	H04W 48/18

OTHER PUBLICATIONS

Nokia: Discussion on network/cell selection for specific network slice(s)', 3GPP Draft; S1-201059, 3GPP TSG-SA WG1 Meeting #89e, E-Meeting, Feb. 2020; 2 pages.

* cited by examiner

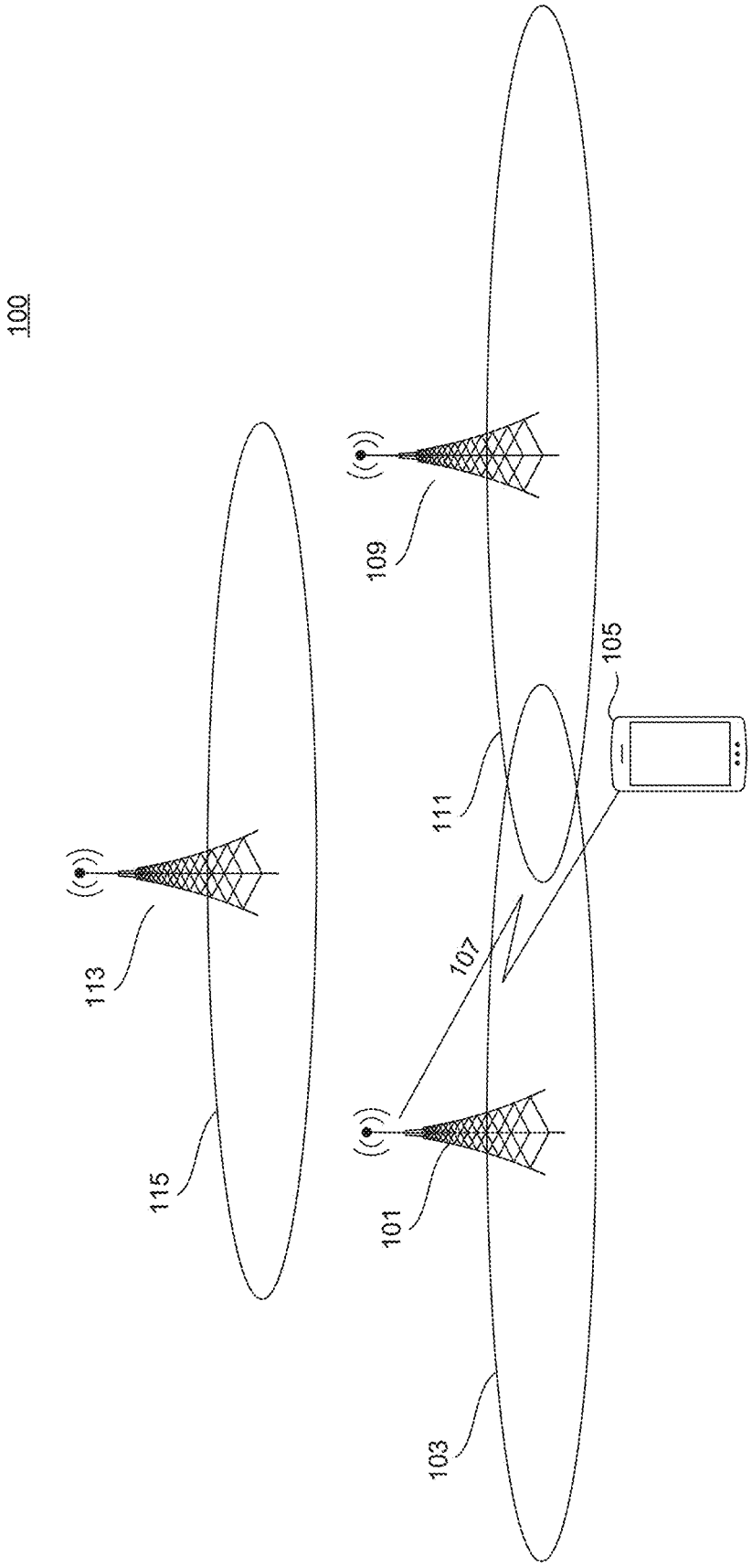


FIG. 1

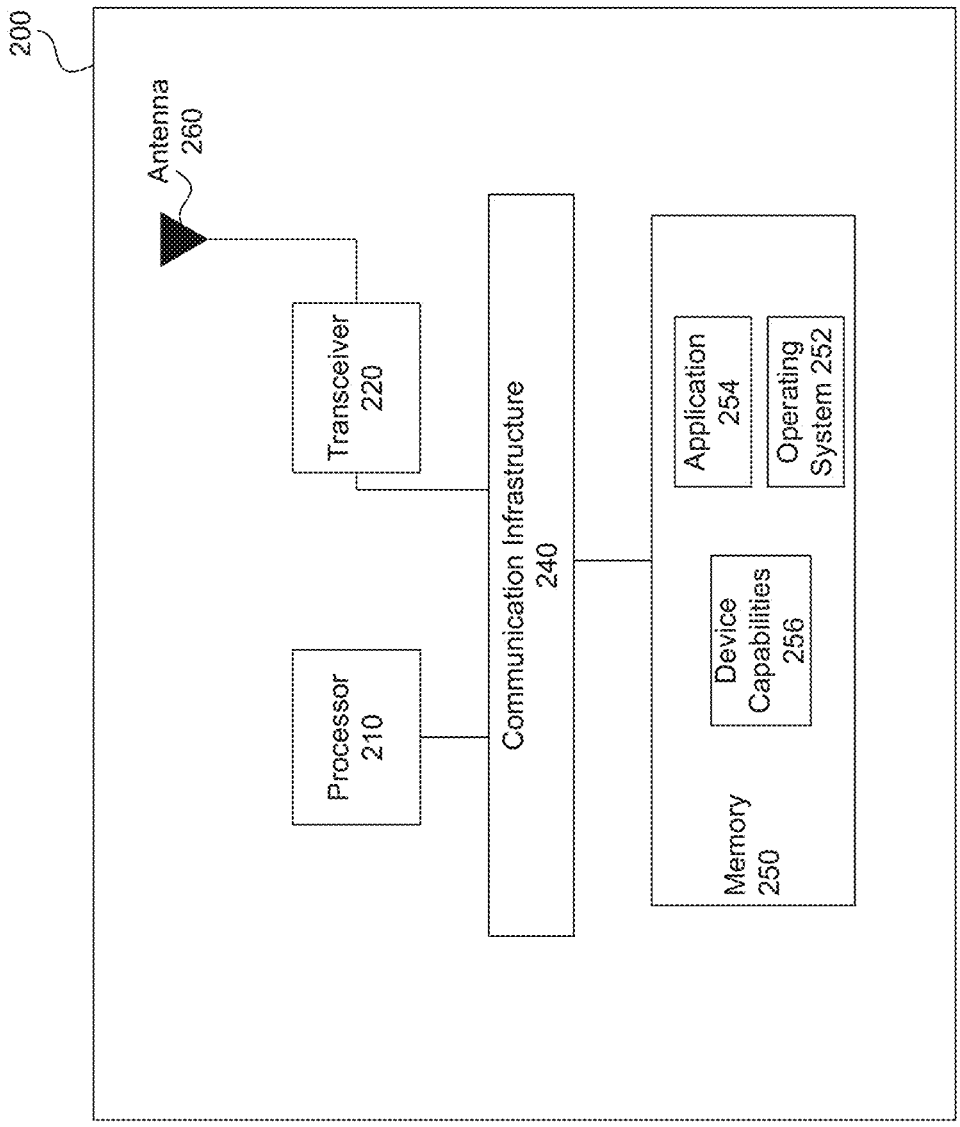

200
Antenna
260
Transceiver
220
Processor
210
Communication Infrastructure
240
Memory
250
Application
254
Operating System 252
Device Capabilities
256

FIG. 2

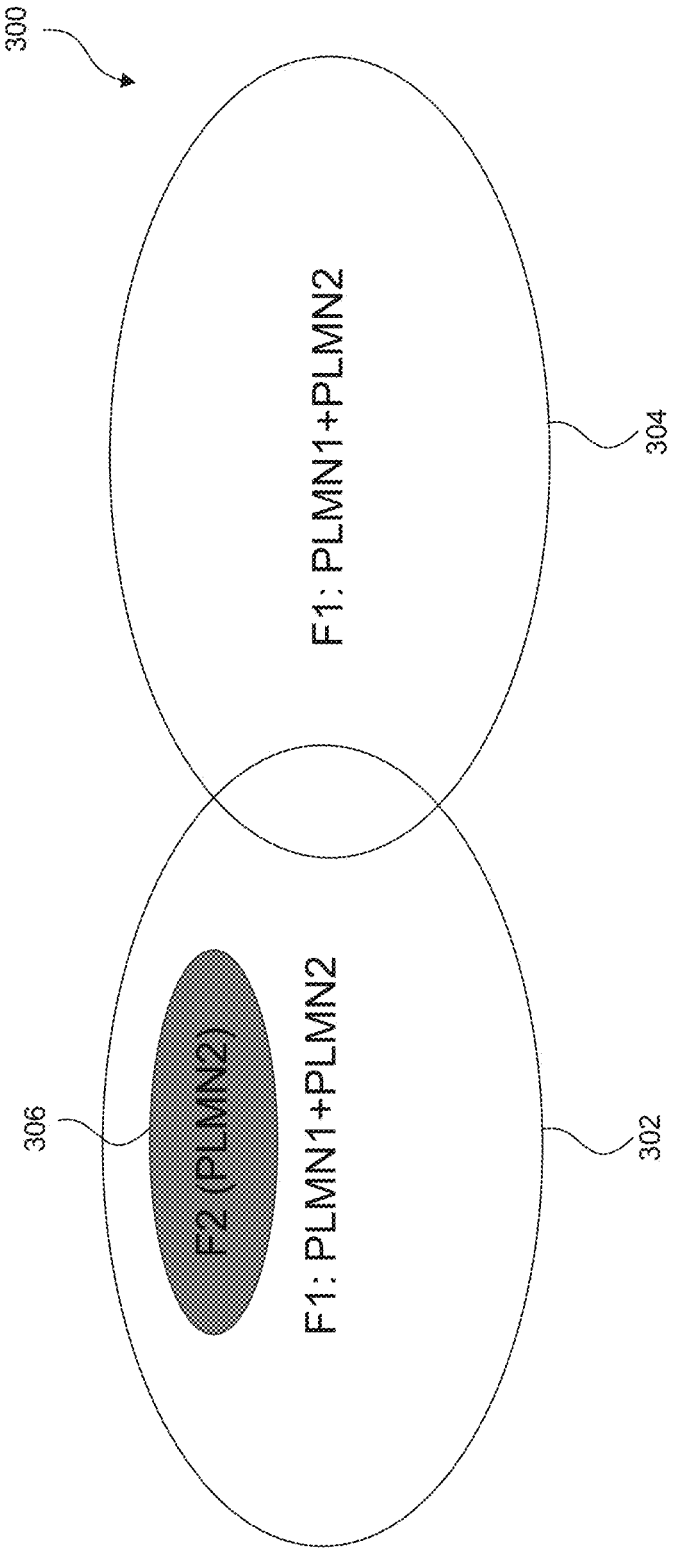


FIG. 3

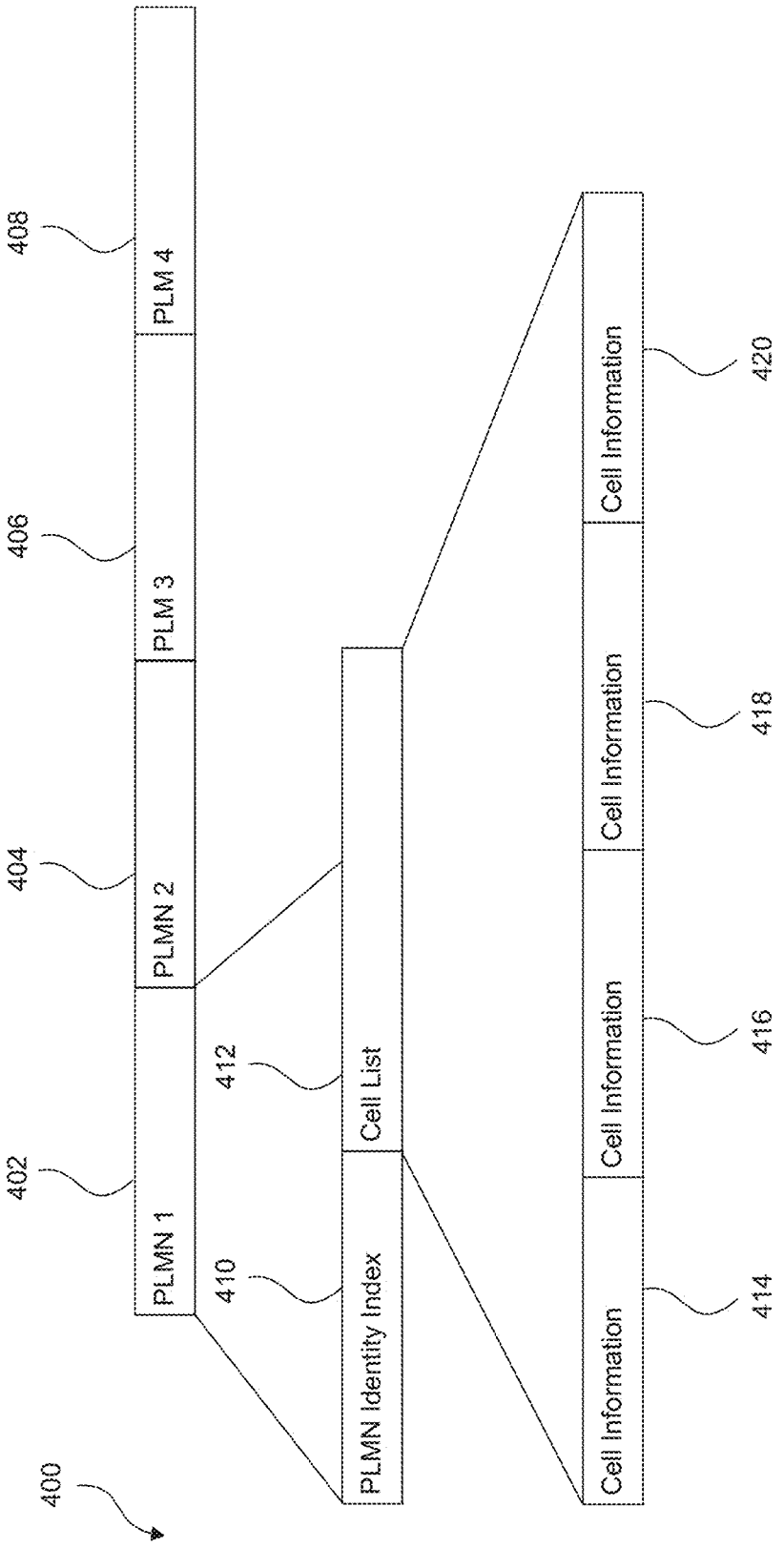

400
PLMN 1
PLMN 2
PLM 3
PLM 4
402
404
406
408
410
412
PLMN Identity Index
Cell List
Cell Information
Cell Information
Cell Information
Cell Information
414
416
418
420

FIG. 4

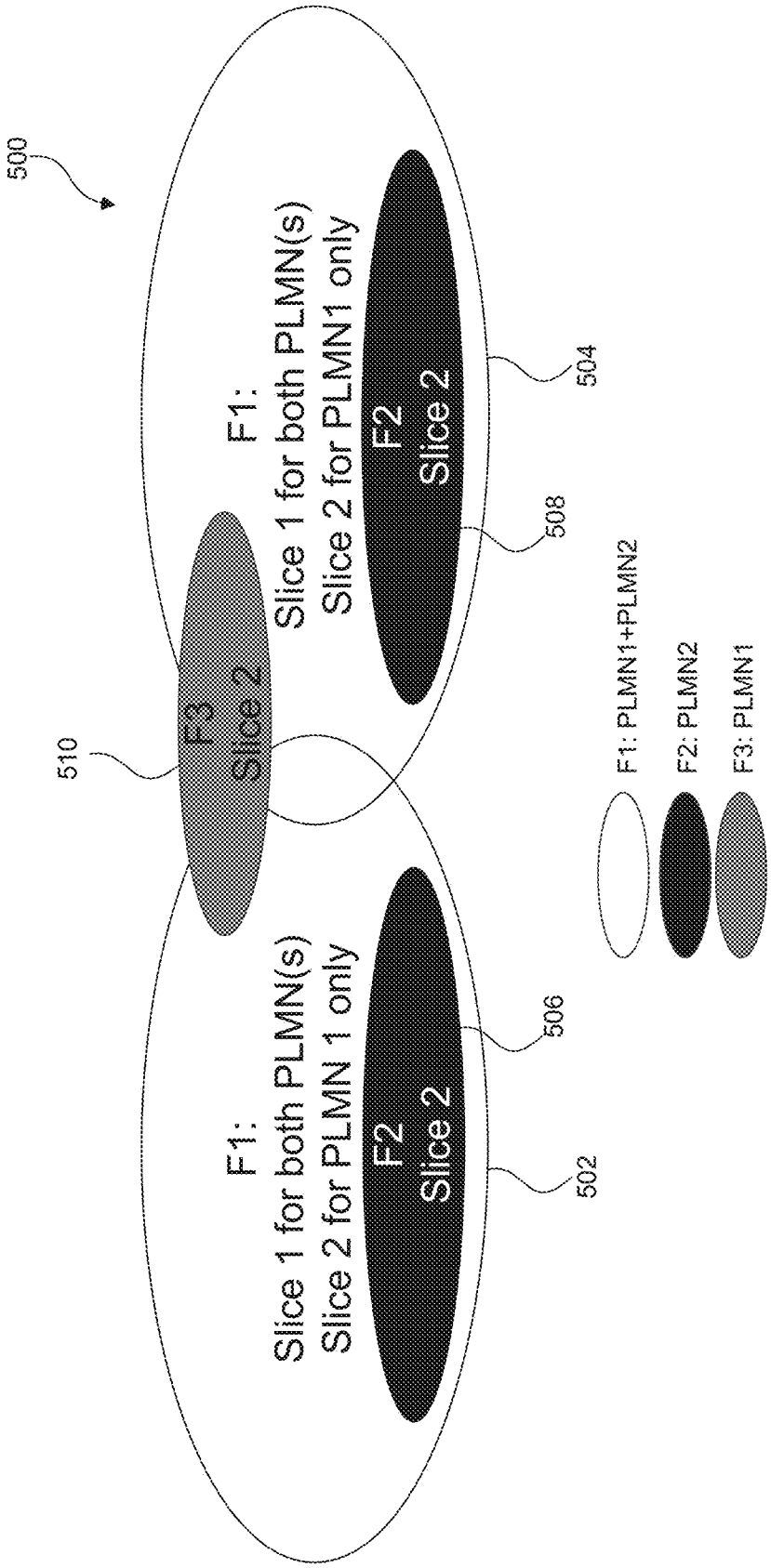

500
F1:
Slice 1 for both PLMN(s)
Slice 2 for PLMN1 only
F2
Slice 2
504
508
F3
Slice 2
510
F1:
Slice 1 for both PLMN(s)
Slice 2 for PLMN 1 only
F2
Slice 2
506
502
F1: PLMN1+PLMN2
F2: PLMN2
F3: PLMN1

FIG. 5

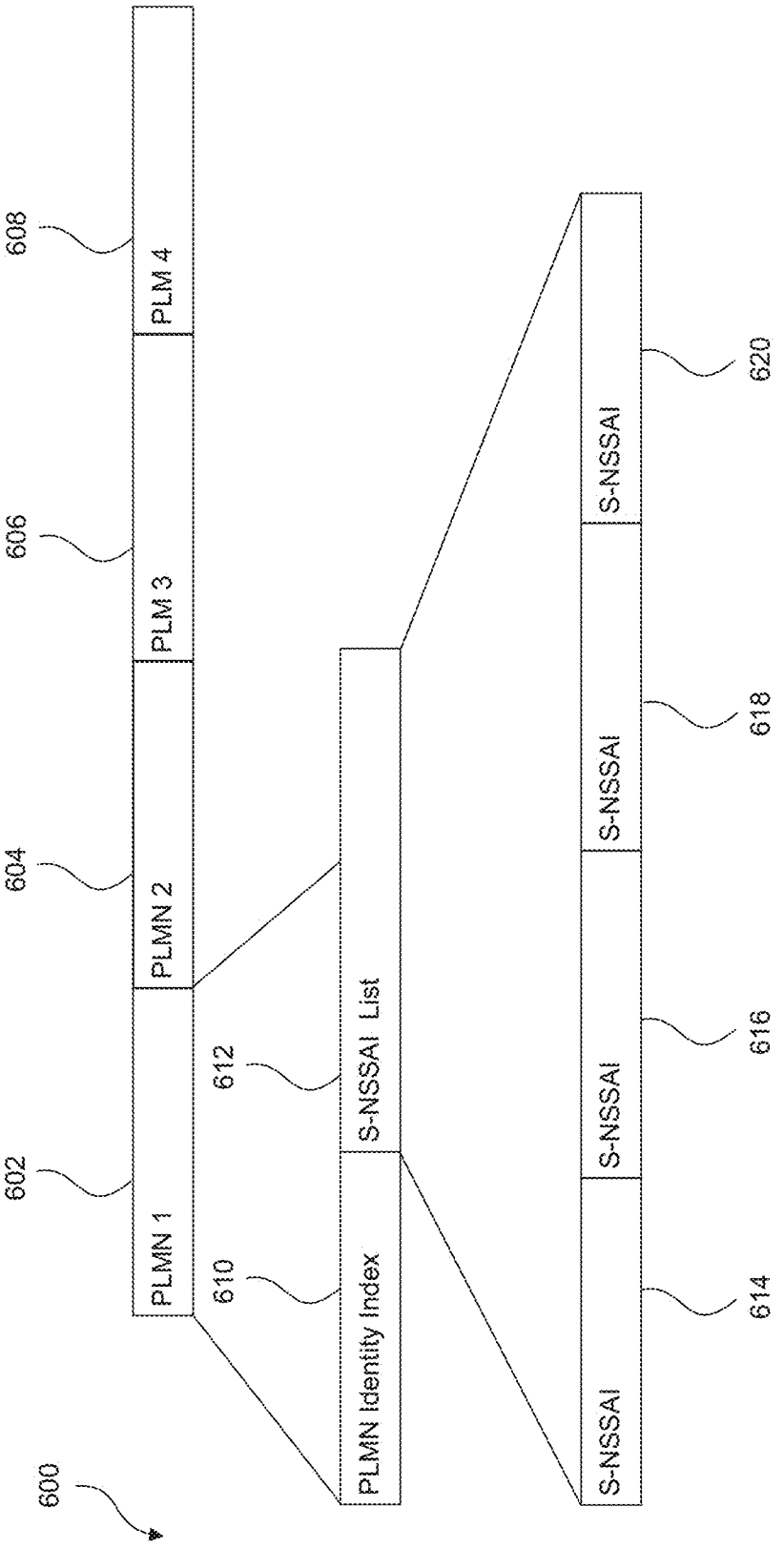

600
602
PLMN 1
604
PLMN 2
606
PLM 3
608
PLM 4
610
PLMN Identity Index
612
S-NSSAI List
614
S-NSSAI
616
S-NSSAI
618
S-NSSAI
620
S-NSSAI

FIG. 6

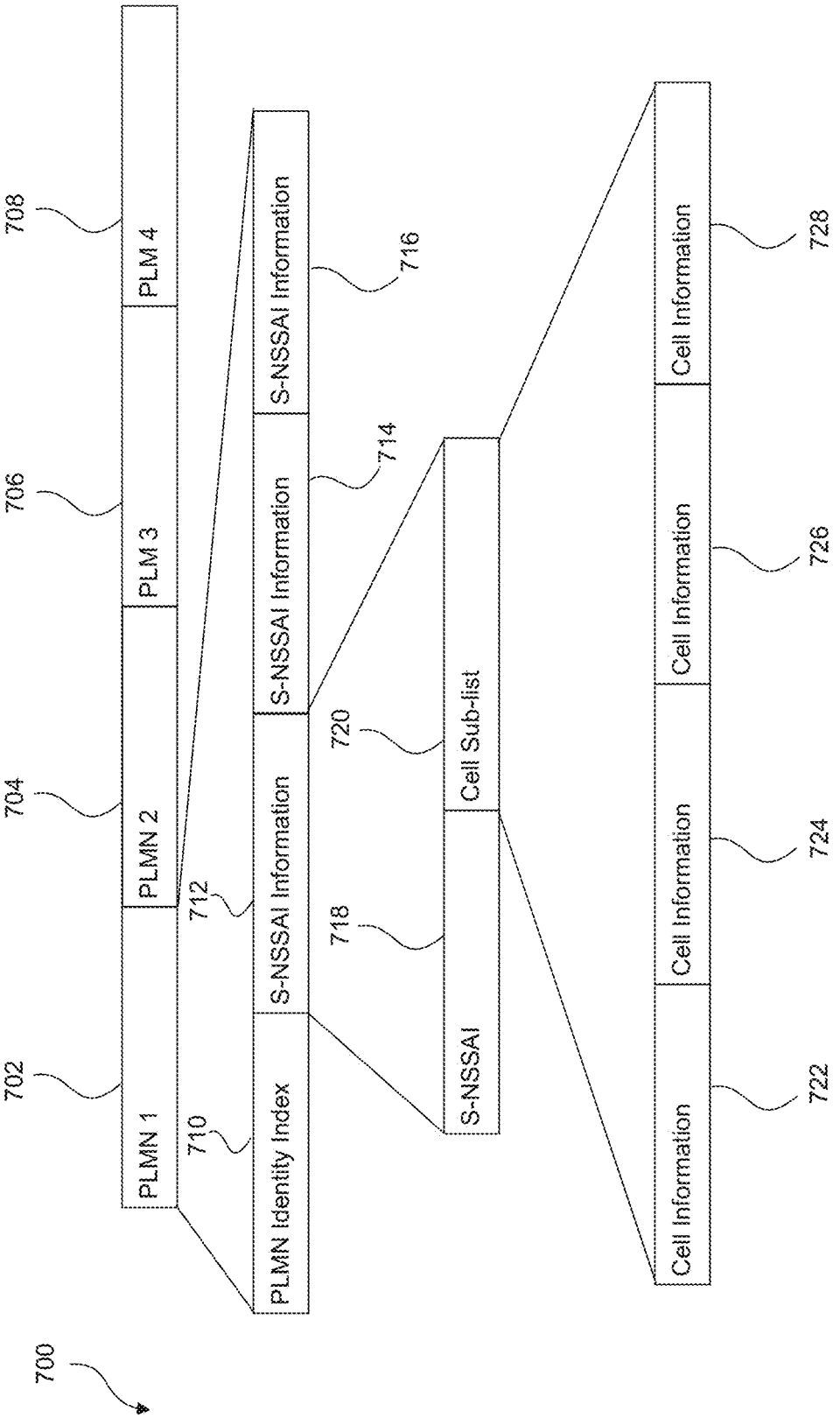

700
PLMN 1
PLMN 2
PLM 3
PLM 4
702
704
706
708
PLMN Identity Index
S-NSSAI Information
S-NSSAI Information
S-NSSAI
Cell Sub-list
710
712
714
716
718
720
Cell Information
Cell Information
Cell Information
Cell Information
722
724
726
728

FIG. 7

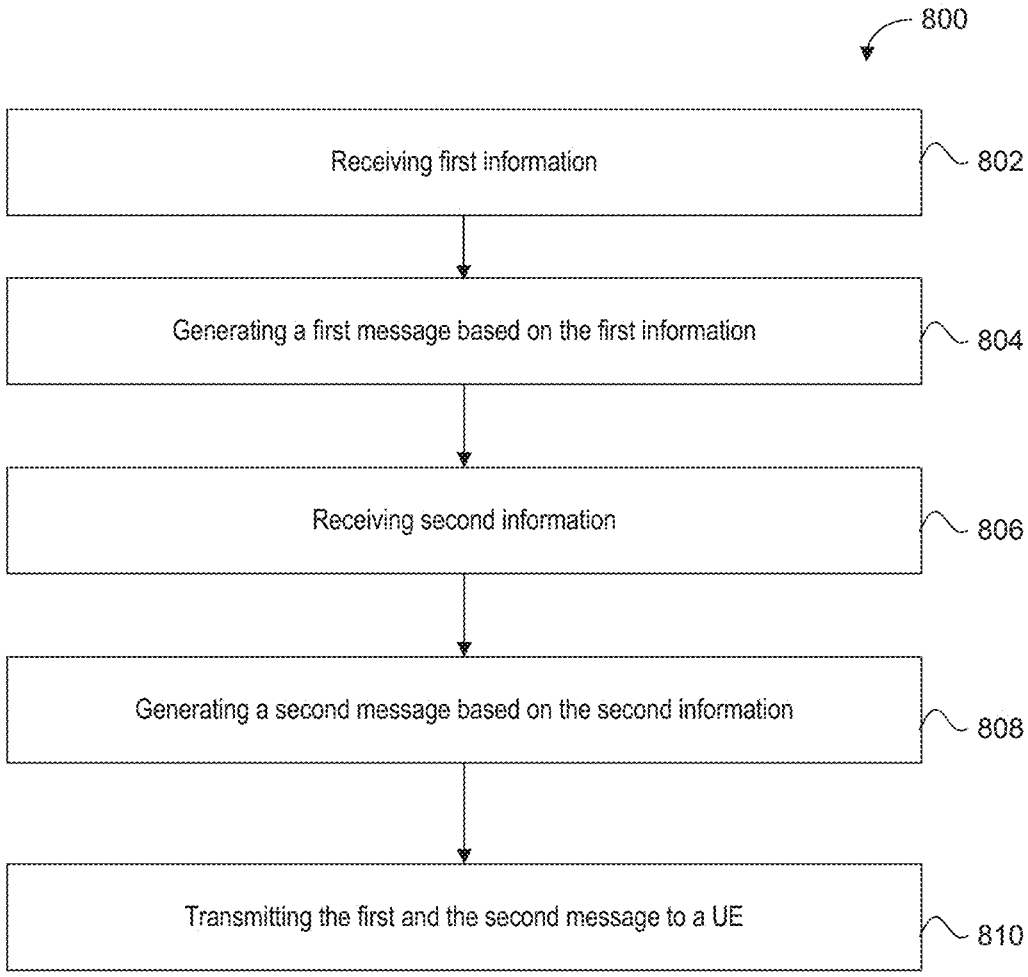

800
Receiving first information
802
Generating a first message based on the first information
804
Receiving second information
806
Generating a second message based on the second information
808
Transmitting the first and the second message to a UE
810

FIG. 8

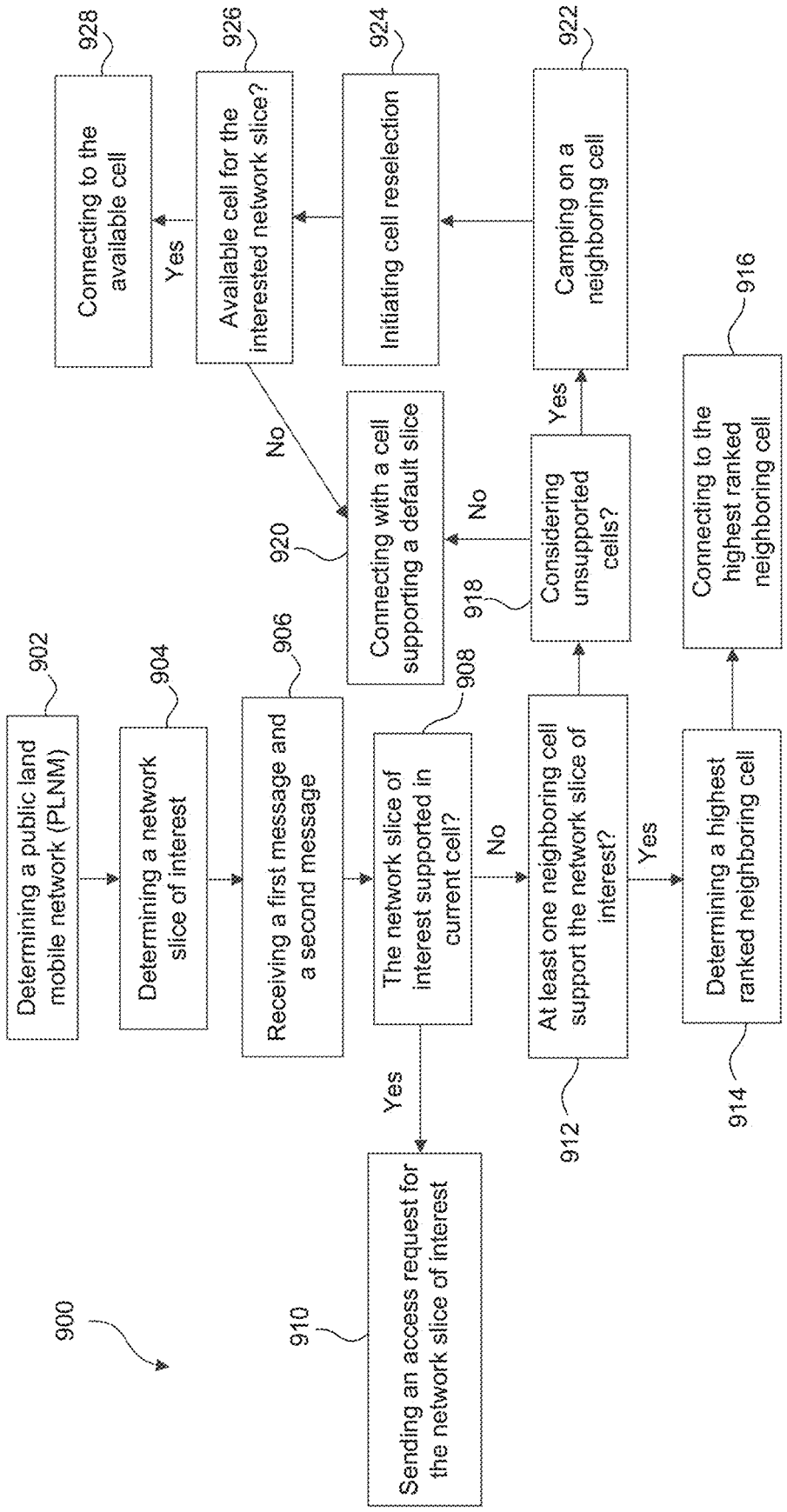

900
902
Determining a public land mobile network (PLNM)
904
Determining a network slice of interest
906
Receiving a first message and a second message
908
The network slice of interest supported in current cell?
Yes
No
910
Sending an access request for the network slice of interest
912
At least one neighboring cell support the network slice of interest?
Yes
914
Determining a highest ranked neighboring cell
916
Connecting to the highest ranked neighboring cell
No
918
Considering unsupported cells?
Yes
920
Connecting with a cell supporting a default slice
922
Camping on a neighboring cell
924
Initiating cell reselection
926
Available cell for the interested network slice?
Yes
928
Connecting to the available cell

FIG. 9

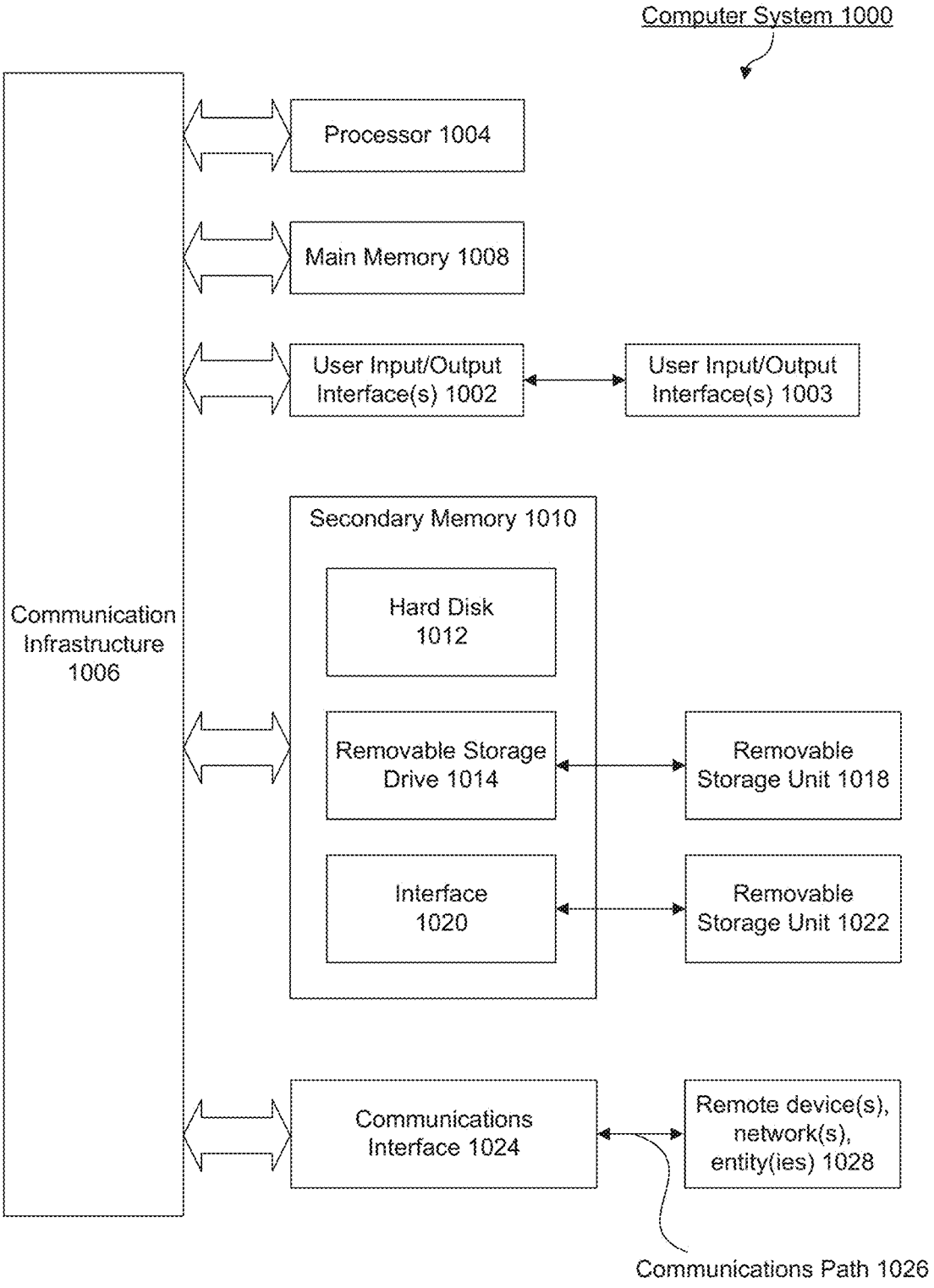

Computer System 1000
Processor 1004
Main Memory 1008
User Input/Output Interface(s) 1002
User Input/Output Interface(s) 1003
Secondary Memory 1010
Hard Disk 1012
Removable Storage Drive 1014
Removable Storage Unit 1018
Interface 1020
Removable Storage Unit 1022
Communication Infrastructure 1006
Communications Interface 1024
Remote device(s), network(s), entity(ies) 1028
Communications Path 1026

FIG. 10

NETWORK SLICING WITH RADIO ACCESS NETWORK (RAN) SHARING

This application is a U.S. National Phase of International Application No. PCT/CN2021/071386, filed Jan. 13, 2021, which is hereby incorporated by reference in its entirety.

BACKGROUND

Field

The described aspects generally relate to an enhancement on radio access network (RAN) support of network slicing. For example, some aspects of this disclosure relate to a network slice based cell reselection.

SUMMARY

Some aspects of this disclosure relate to apparatuses and methods for implementing an enhancement on radio access network (RAN) support of network slicing for 3rd Generation Partnership Project (3GPP) release 15 (Rel-15), release 16 (Rel-16), and/or release 17 (Rel-17), and other 3GPP releases that support network slicing. For example, systems and methods are provided for implementing designs of determining a network slice of interest to a UE, determining a base station that supports the network slice of interest to the UE, and connecting to the base station.

Some aspects of this disclosure relate to a base station configured to support wireless communication within a cell. The base station includes a transceiver and a processor communicatively coupled to the transceiver. The processor circuitry is configured to generate first and second messages and transmit, using the transceiver, the first message and the second message to a user equipment (UE). The first message is associated with a cell supported by the base station and includes a first public land mobile network (PLMN) identity index and a first list of one or more network slices supported by a first PLMN associated with the first PLMN identity index. The second message is associated with one or more neighboring cells, and includes the first PLMN identity index and a second list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells. In addition, at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data.

Some aspects of this disclosure relate to the base station, wherein the first message is a system information block type 1 (SIB1) message and the second message is a system information block type 4 (SIB4) message.

Some aspects of this disclosure relate to the base station, wherein the first list includes single network slice selection assistance information (S-NSSAI) for each of the one or more network slices in the first list and wherein each of the one or more network slice data in the second list further includes single network slice selection assistance information (S-NSSAI).

Some aspects of this disclosure relate to the base station, wherein each of the one or more neighboring cell data includes frequency information and the one or more neighboring cell data are ranked in the sub-list according to corresponding priorities.

Some aspects of this disclosure relate to a method of a base station. The method includes generating a first and a second messages and transmitting the first and the second messages to a user equipment (UE). The first message is associated with a cell supported by the base station and includes a first public land mobile network (PLMN) identity index and a first list of one or more network slices supported by a first PLMN associated with the first PLMN identity index. The second message is associated with one or more neighboring cells, and includes the first PLMN identity index and a second list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells. In addition, at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data.

Some aspects of this disclosure relate to a method of a base station, wherein the first message is a system information block type 1 (SIB1) message and the second message is a system information block type 4 (SIB4) message.

Some aspects of this disclosure relate to a method of a base station, wherein the first list includes single network slice selection assistance information (S-NSSAI) for each of the one or more network slices in the first list and wherein each of the one or more network slice data in the second list further includes single network slice selection assistance information (S-NSSAI).

Some aspects of this disclosure relate to a method of a base station, wherein each of the one or more neighboring cell data includes frequency information and the one or more neighboring cell data are ranked in the sub-list according to corresponding priorities.

Some aspects of this disclosure relate to a user equipment (UE). The UE includes a transceiver configured to communicate with a base station and a processor communicatively coupled to the transceiver. The processor is configured to determine a public land mobile network (PLMN) serving the UE and a network slice of interest. The processor is also configured to receive, using the transceiver, a first message and a second message, wherein the first message is associated with a cell and includes a public land mobile network (PLMN) identity index associated with a PLMN and a first list of one or more network slices, wherein the second message is associated with one or more neighboring cells and includes the PLMN identity index, a second list of one or more network slice data, and wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data. The processor is also configured to determine at least based on the first message that the network slice of interest is not supported by the PLMN in the cell and determine at least based on the second message, neighboring cell data associated with the network slice of interest and the PLMN. The processor is further configured to establish, using the transceiver, a communication link with a neighboring cell of the one or more neighboring cells at least based on the neighboring cell data and transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest.

Some aspects of this disclosure relate to the UE, wherein the first message is a system information block type 1 (SIB1) message and the second message is a system information block type 4 (SIB4) message.

Some aspects of this disclosure relate to the UE, wherein the processor is further configured to determine at least based on the first message that the network slice of interest is not supported by determining that the network slice of interest is not in the first list of one or more network slices.

Some aspects of this disclosure relate to the UE, wherein the processor is further configured to determine at least based on the second message the neighboring cell data associated with the network slice of interest and the PLMN by determining that the PLMN identity index corresponds to the PLMN; determining that the at least one of the one or

more network slice data includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest, and determining that the neighboring cell data is in the sub-list.

Some aspects of this disclosure relate to a method. The method includes determining a public land mobile network (PLMN) serving a UE, wherein the UE connects to a cell and an network slice of interest. The method includes receiving a first message and a second message, wherein the first message is associated with the cell and includes a public land mobile network (PLMN) identity index and a first list of one or more network slices, wherein the second message is associated with one or more neighboring cells and includes the PLMN identity index, a second list of one or more network slice data, and wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data. The method also includes determining at least based on the first message that the network slice of interest is not supported by the PLMN in the cell and determining at least based on the second message, neighboring cell data associated with the network slice of interest and the PLMN. The method further includes establishing a communication link with a neighboring cell of the one or more neighboring cells at least based on the neighboring cell data and transmitting a request to the neighboring cell to access the network slice of interest.

This Summary is provided merely for purposes of illustrating some aspects to provide an understanding of the subject matter described herein. Accordingly, the above-described features are merely examples and should not be construed to narrow the scope or spirit of the subject matter in this disclosure. Other features, aspects, and advantages of this disclosure will become apparent from the following Detailed Description, Figures, and Claims.

BRIEF DESCRIPTION OF THE FIGURES

The accompanying drawings, which are incorporated herein and form part of the specification, illustrate the present disclosure and, together with the description, further serve to explain the principles of the disclosure and enable a person of skill in the relevant art(s) to make and use the disclosure.

FIG. **1** illustrates an example system implementing radio access network (RAN) support of network slicing, according to some aspects of the disclosure.

FIG. **2** illustrates a block diagram of an example system of an electronic device for the radio access network (RAN) support of network slicing, according to some aspects of the disclosure.

FIG. **3** illustrates an example of cell distribution according aspects of the disclosure.

FIG. **4** illustrates an example of neighboring cells information according aspects of the disclosure.

FIG. **5** illustrates an example of cell distribution with network slices according aspects of the disclosure.

FIG. **6** illustrates an example of local cell information according aspects of the disclosure.

FIG. **7** illustrates an example of neighboring cells slices information according aspects of the disclosure.

FIG. **8** illustrates an example method for a base station supporting a network slice based cell selection and/or reselection according aspects of the disclosure.

FIG. **9** illustrates an example method **900** for a UE performing a network slice based cell selection and/or reselection according aspects of the disclosure.

FIG. **10** is an example computer system for implementing some aspects of the disclosure or portion(s) thereof.

The present disclosure is described with reference to the accompanying drawings. In the drawings, generally, like reference numbers indicate identical or functionally similar elements. Additionally, generally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

DETAILED DESCRIPTION

Some aspects of this disclosure include apparatuses and methods for implementing enhancement of radio access network (RAN) support of network slicing for 3rd Generation Partnership Project (3GPP) release 15 (Rel-15), release 16 (Rel-16), and/or release 17 (Rel-17), and other 3GPP releases that support network slicing. For example, systems and methods are provided for implementing designs for determining a network slice of interest to a UE, determining a base station that supports the network slice of interest to the UE, and connecting to the base station.

According to some aspects, a base station that operates according to Release 15 (Rel-15), Release 16 (Rel-16), and/or Release 17 (Rel-17) New Radio (NR) of 5^{th} generation (5G) wireless technology for digital cellular networks as defined by 3rd Generation Partnership Project (3GPP) may support one or more cells that provide services to a user equipment (UE). For example, the base station may support a first cell and a second cell. Each of the one or more cells may support one or more public land mobile networks (PLMNs). In some aspects, the first and second cells may support different PLMNs. For example, the first cell may support a PLMN 1 and a PLMN 2. While the second cell may support the PLMN 1 and a PLMN 3. The UE may determine the PLMN 2 to be its serving operator and therefore may connect to the first cell. In some aspects, the one or more cells may support same PLMNs. For example, the first and the second cell may both support the PLMN 1 and the PLMN 2. The UE may determine the PLMN 2 to be its serving operator and therefore may connect to either the first cell or the second cell.

According to some aspects, the UE may have the PLMN 3 as its serving operator and may connect to the first cell via the base station. The UE may receive system information from the base station to determine the PLMNs that are supported in the first cell. For example, the UE may receive a system information block type 1 (SIB1) message from the base station and determine based on the SIB1 message that the PLMN 3 is not supported in the first cell. In such a case, the UE may perform a cell reselection. For example, the UE may receive SIB1 messages from neighboring cells to determine supporting PLMNs of the neighboring cells. The UE may receive a SIB1 message from a third cell via a second base station and may determine that the PLMN 3 is supported by the third cell. The UE may subsequently establish communications with the third cell via the second base station. In some aspects, the first cell may operate on a first frequency and the third cell may operate on a second frequency. In other aspects, the first cell and the third cell may both operate on the first frequency.

According to some aspects, the UE may have the PLMN 3 as its serving operator and may connect to the first cell via the base station. The UE may move away from the base station because a user of the UE moves away from the base station. The UE may determine that a signal power level from the base station is lower than a threshold. For example, the UE may detect a reference signals received power

(RSRP) and may determine that the RSRP is below a power level threshold, wherein the power level threshold may be required to maintain communications between the base station and the UE. In such a case, the UE may perform a cell reselection or a hand over. The UE may measure signal strength of neighboring cells and select a neighboring cell with a strongest signal strength. For example, the UE may determine that the third cell supported by the second base station has the strongest signal strength. Similar as discussed above, the UE may receive the SIB1 message regarding the third cell and determine that the PLMN 3 is supported by the third cell. The UE may subsequently establish communications with the third cell via the second base station.

According to some aspects, the UE may have the PLMN 3 as its serving operator and may connect to the first cell via the base station. The UE may determine that the PLMN 3 is not supported by the first cell at least based on the SIB1 message received from the first cell as discussed above. In such a case, the UE may perform a cell reselection. In some aspects, the UE may receive system information regarding neighboring cells from the base station. For example, the UE may receive a system information block type 4 (SIB4) message from the base station. The SIB4 message may include neighboring cell data regarding the PLMNs. For example, the SIB4 message may include neighboring cell data regarding the PLMN 3. The neighboring cell data may be frequency information. In some aspects, the SIB4 message may indicate that cells that operate on the second frequency support the PLMN 3. In some examples, the third cell supported by the second base station may operate on the second frequency. The UE may detect the third cell on the second frequency and establish communications with the third cell via the second base station.

According to some aspects, multiple cells may operate on the second frequency. For example, a fourth cell supported by a third base station may operate on the second frequency as well. Thus, the UE may detect both the third and the fourth cells on the second frequency. The UE may select a cell with a stronger signal strength to connect. For example, the UE may detect signal strength received from the third and the fourth cell. The UE may determine that the signal strength of the third cell is stronger and may connect to the third cell via the second base station.

According to some aspects, the neighboring cell data may include a plurality of frequency information. For example, the neighboring cell data may include the second frequency and a third frequency. In such a case, the neighboring cell data indicates that cells operating on either the second or the third frequency support the PLMN 3. The neighboring cell data may rank the second and the third frequency in an order. For example, the second frequency may rank higher than the third frequency. The order may be based on priorities of the first and the third frequencies. The UE may determine to establish communications with cells based on ranks of the neighboring cell data. For example, the UE may determine to establish communications with the cells operating on a frequency that ranks the highest in the neighboring cell data. For example, the UE may determine to connect to cells operating on the second frequency.

In some aspects, cells operating on the highest ranked frequency may not be available. For example, the third cell operating on the second frequency may reach their system capacities, e.g., a number of UEs that connect to the third cell is greater than or equal to a maximum number of UEs that the third cell is able to support. In such a case, the UE may determine to establish communications with the cell operating on a second highest ranked frequency, e.g., the third frequency.

According to some aspects, the base station may support one or more network slices. Each network slice may provide a service to the UE. For example, the one or more network slices may include enhanced mobile broadband (eMBB) services, ultra-reliable and low-latency communication (URLLC) services, massive machine-type communication (mMTC) service, or any other type of services. In some aspects, each network slice may correspond to a quality of service (QoS). For example, a network slice of eMBB service may have high data rates and high traffic volumes. A network slice of the URLLC service may have low error rates/packet loss rates and low latencies. A network slice of the eMTC service may have low power consumption rates and a high connection capacity.

According to some aspects, the one or more network slice may be PLMN-specific and cell-specific. For example, the base station may provide services of a network slice 1 and a network slice 2 in the first cell for the PLMN 1. The base station may also provide services of the network slice 1 and a network slice 3 in the first cell for the PLMN 2. The UE may have the PLMN 1 as its serving operator. In such a case, the UE may have access to the network slice 1 and the network slice 2 when connecting to the first cell via the base station. In contrast, if the UE have the PLMN 2 as its serving operator, the UE may have access to the network slice 1 and the network slice 3 when connecting to the second cell via the base station. In other words, a cell may support different network slices for different PLMNs.

According to some aspects, the UE may have the PLMN 1 as its serving operator and may connect to the first cell via the base station. The UE may determine that a network slice of interest to the UE is the network slice 3. Similar to discussion above, the UE may receive system information regarding the first cell from the base station. For example, the UE may receive the SIB1 message from the base station. The SIB1 message may indicate that the first cell supports the network slice 1 and the network slice 2 for the PLMN 1. Therefore, the UE may determine that the network slice of interest to the UE, e.g., the network slice 3, is not supported by the first cell for PLMN 1. In such a case, the UE may perform a cell reselection to connect to a cell that supports the network slice of interest for the PLMN 1. The UE may receive SIB1 messages from the neighboring cells to determine which the neighboring cells supports the network slice of interest for PLMN 1. For example, the UE may receive an SIB1 message from the third cell via the second base station and determine that the PLMN 1 is supported by the third cell. The UE may also determine at least based on the SIB1 message received from the third cell that the network slice 3 is supported by the third cell for PLMN 1. The UE may subsequently establish communications with the third cell via the second base station. In some aspects, the first cell may operate in the first frequency and the third cell may operate in the second frequency. In other aspects, the first cell and the third cell both operate on the first frequency.

According to some aspects, the UE may have the PLMN 1 as its serving operator and may connect to the first cell via the base station. Similar to discussion above, the UE may determine that the network slice of interest to the UE is the network slice 3. The UE may move away from the base station. The UE may determine that a signal power level of the base station is lower than a threshold. For example, the UE may detect a reference signal received power (RSRP) and determine that the RSRP is below a power level thresh-

old, wherein the power level threshold may be required to maintain communications between the base station and the UE. The UE may measure signal strength of neighboring cells and select a neighboring cell with a strongest signal strength. For example, the UE may determine that the third cell of the second base station has a strongest signal strength. In such a case, the UE may receive a SIB1 message from the third cell and determine that the network slice 3 is supported by the third cell for the PLMN 1. The UE may subsequently establish communications with the third cell via the second base station.

According to some aspects, the UE may have the PLMN 1 as its serving operator and may connect to the first cell via the base station. The UE may determine that a network slice of interest to the UE is network slice 3. The UE may determine that the network slice 3 is not supported in the first cell for the PLMN 1 at least based on the SIB1 message received from the base station as discussed above. In some aspects, the UE may receive system information regarding neighboring cells from the base station. For example, the UE may receive a system information block type 4 (SIB4) message from the base station. The SIB4 message may include neighboring cell data regarding the PLMNs and supported network slices. For example, the SIB4 message may include neighboring cell data that indicate cells that support network slice 3 for the PLMN 1. The neighboring cell data may be frequency information. For example, the SIB4 message may indicate that cells that operate on the second frequency support the network slice 3 for PLMN 1. In some examples, the third cell of the second base station may operate on the second frequency. The UE may detect the third cell on the second frequency and establish communications with the third cell via the second base station.

According to some aspects, the neighboring cell data may include information regarding a plurality of frequencies. For example, the neighboring cell data may include the second frequency and a third frequency. The neighboring cell data may rank the second and the third frequencies in an order. For example, the second frequency may rank higher than the third frequency. The order may be based on priorities of the second and the third frequencies. The UE may determine to establish communications with cells operating on a frequency that ranks the highest in the neighboring cell data. For example, the UE may determine to connect to cells operating on the second frequency.

In some aspects, cells operating on the highest ranked frequency may not be available. For example, the third cell operating on the second frequency may reach its system capacities, e.g., a number of UEs that connect to the third cell is greater than or equal to a maximum number of UEs that the third cell is able to support. In such a case, the UE may determine to establish communications with the cell operating on a second highest ranked frequency, e.g., the third frequency.

FIG. **1** illustrates an example system **100** implementing designs of New Radio (NR) radio access network (RAN) support of network slicing, according to some aspects of the disclosure. Example system **100** is provided for the purpose of illustration only and does not limit the disclosed aspects. System **100** may include, but is not limited to, a base station **101**, such as a gNB, and an electronic device, represented as a UE **105**. The UE **105** may be implemented as an electronic device configured to operate based on a wide variety of wireless communication techniques. These techniques may include, but are not limited to, techniques based on 3rd Generation Partnership Project (3GPP) standards. For example, the UE **105** may include an electronic device configured to operate using one or more 3GPP releases, such as Release 15 (Rel-15), Release 16 (Rel-16), or Release 17 (Rel-17) or other 3GPP releases. The UE **105** may include, but is not limited to, wireless communication devices, smart phones, laptops, desktops, tablets, personal assistants, monitors, televisions, wearable devices, Internet of Things (IoT) devices, vehicle communication devices, and the like. The base station **101** may include one or more nodes configured to operate based on a wide variety of wireless communication techniques such as, but not limited to, techniques based on 3GPP standards. For example, the base station **101** may include nodes configured to operate using Rel-15, Rel-16, Rel-17, or other 3GPP releases. In some aspects, the base station **101** may support a cell **103**. The UE **105** may connect to the cell **103** via the base station **101**. The base station **101** may communicate with the UE **105** via one or more communication links **107**. The one or more communication links **107** may include an uplink (UL) and a downlink (DL). The system **100** may further include a base station **109** that supports a cell **111**, wherein the cell **103** and the cell **111** may partially overlap. The system **100** may further include a base station **113** that supports a cell **115**.

According to some aspects, the cell **103** may support a PLMN 1 and a PLMN 2, the cell **111** may support the PLMN 1 and the PLMN 2, and the cell **115** may support the PLMN 2. The UE **105** may determine its serving operating to be the PLMN 1. For example, the UE may determine its operator to be the PLMN 1 at least based on an international mobile subscriber identity (IMSI) of the UE **105**. The UE **105** may receive system information from the base station **101** regarding the supported PLMNs of the cell **103**. For example, the UE **105** may receive an SIB1 message from the base station **101**. The SIB1 message may indicate that cell **103** of the base station **101** supports PLMN 1 and PLMN 2. In some aspects, the SIB1 message includes information corresponding to a current connecting cell or a local cell. For example, the SIB1 message received by the UE **105** from the base station **101** when connecting to the cell **103** includes the information of the cell **103**. In such a case, the current connecting cell or the local cell is the cell **103**.

According to some aspects, the UE **105** may move away from the base station **101** because a user of the UE **105** moves away from the base station **101**. The UE **105** may determine that a signal power level from the base station **101** is lower than a threshold. For example, the UE **105** may detect a reference signal received power (RSRP) and determine that the RSRP is below a power level threshold, wherein the power level threshold may be required to maintain communications between the base station **101** and the UE **105**. In such a case, the UE **105** may measure signal strength of neighboring cells, such as the cell **111** and the cell **115**, and select a neighboring cell with a strongest signal strength. For example, the UE **105** may measure the signals received from the base station **113** and the base station **109**. The UE **105** may determine that the signal from the base station **109** has a higher signal strength. The UE **105** may determine that the cell **111** to be a potential cell to connect. Subsequently, the UE **105** may receive, from the base station **109**, a second SIB1 message, which indicates that the cell **111** supports the PLMN 1 and the PLMN 2. Because the operator of the UE **105** is the PLMN 1, the UE **105** may determine to establish communications with the cell **111** via the base station **109** in order to take advantage of the higher signal strength and access services from PLMN 1.

According to some aspects, the UE **105** may determine that the signal from the base station **113** has a higher signal strength compared with the signal from the base station **109**.

The UE may receive, from the base station **113**, a third SIB1 message, which indicates that the cell **115** supports the PLMN 2 only. Because the operator of the UE **105** is the PLMN 1, the UE **105** may determine that the cell **115** is not a suitable cell to connect. Subsequently, the UE may receive the second SIB1 message from the base station **109** and determine, at least based the second SIB1 message, to connect to the cell **111** via the base station **109**.

According to some aspects, the cell **103** may support different network slices for different PLMNs. For example, the cell **103** may support a network slice 1 and a network slice 2 for the PLMN 1 and a network slice 3 and a network slice 4 for the PLMN 2. In other words, the PLMN 1 and PLMN 2 share a frequency of the cell **103**, but support different network slices. In some aspect, the cell **103** may support same network slices for different PLMNs. For example, the cell **103** may support the network slice 1 and 2 for both the PLMN 1 and the PLMN 2. In other words, the PLMN 1 and the PLMN 2 share the frequency of the cell **103** and support the same network slices 1 and 2. In some aspects, the shared frequency of the cell **103** is 700 MHz.

FIG. **2** illustrates a block diagram of an example system **200** of an electronic device implementing mechanisms for designs of radio access network (RAN) support of network slicing, according to some aspects of the disclosure. The system **200** may be any of the electronic devices (e.g., a base station **101**, **109**, **113**, and an UE **105**) of the system **100**. The system **200** includes a processor **210**, one or more transceivers **220**, a communication infrastructure **240**, a memory **250**, an operating system **252**, an application **254**, and one or more antennas **260**. Illustrated systems are provided as exemplary parts of system **200**, and system **200** may include other circuit(s) and subsystem(s). Also, although the systems of system **200** are illustrated as separate components, the aspects of this disclosure may include any combination of these, e.g., less, or more components.

The memory **250** may include random access memory (RAM) and/or cache, and may include control logic (e.g., computer software) and/or data. The memory **250** may include other storage devices or memory such as, but not limited to, a hard disk drive and/or a removable storage device/unit. According to some examples, the operating system **252** may be stored in the memory **250**. The operating system **252** may manage transfer of data from the memory **250** and/or the one or more applications **254** to the processor **210** and/or the one or more transceivers **220**. In some examples, the operating system **252** maintains one or more network protocol stacks (e.g., Internet protocol stack, cellular protocol stack, and the like) that may include a number of logical layers. At corresponding layers of the protocol stack, the operating system **252** includes control mechanisms and data structures to perform the functions associated with that layer.

According to some examples, the application **254** may be stored in the memory **250**. The application **254** may include applications (e.g., user applications) used by wireless system **200** and/or a user of wireless system **200**. The applications in the application **254** may include applications such as, but not limited to, Siri™, FaceTime™, radio streaming, video streaming, remote control, and/or other user applications.

The system **200** may also include the communication infrastructure **240**. The communication infrastructure **240** provides communication between, for example, the processor **210**, the one or more transceivers **220**, and the memory **250**. In some implementations, the communication infrastructure **240** may be a bus. The processor **210**, alone, or together with instructions stored in the memory **250** performs operations enabling system **200** of the system **100** to implement mechanisms for the RAN support of network slicing, as described herein.

The one or more transceivers **220** transmit and receive communications signals support mechanisms for the RAN support of network slicing. Additionally, the one or more transceivers **220** transmit and receive communications signals that support mechanisms for measuring communication link(s), generating and transmitting system information, and receiving the system information. According to some aspects, the one or more transceivers **220** may be coupled to antenna **260**. Antenna **260** may include one or more antennas that may be the same or different types. The one or more transceivers **220** allow system **200** to communicate with other devices that may be wired and/or wireless. In some examples, the one or more transceivers **220** may include processors, controllers, radios, sockets, plugs, buffers, and like circuits/devices used for connecting to and communication on networks. According to some examples, the one or more transceivers **220** include one or more circuits to connect to and communicate on wired and/or wireless networks.

According to some aspects of this disclosure, the one or more transceivers **220** may include a cellular subsystem, a WLAN subsystem, and/or a Bluetooth™ subsystem, each including its own radio transceiver and protocol(s) as will be understood by those skilled in the arts based on the discussion provided herein. In some implementations, the one or more transceivers **220** may include more or fewer systems for communicating with other devices.

In some examples, the one or more the transceivers **220** may include one or more circuits (including a WLAN transceiver) to enable connection(s) and communication over WLAN networks such as, but not limited to, networks based on standards described in IEEE 802.11.

Additionally, or alternatively, the one or more the transceivers **220** may include one or more circuits (including a Bluetooth™ transceiver) to enable connection(s) and communication based on, for example, Bluetooth™ protocol, the Bluetooth™ Low Energy protocol, or the Bluetooth™ Low Energy Long Range protocol. For example, the transceiver **220** may include a Bluetooth™ transceiver.

Additionally, the one or more the transceivers **220** may include one or more circuits (including a cellular transceiver) for connecting to and communicating on cellular networks. The cellular networks may include, but are not limited to, 3G/4G/5G networks such as Universal Mobile Telecommunications System (UMTS), Long-Term Evolution (LTE), and the like. For example, the one or more transceivers **220** may be configured to operate according to one or more of Rel-15, Rel-16, Rel-17, or other releases of 3GPP standard.

According to some aspects of this disclosure, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, and/or the one or more the transceiver **220**, implements the methods and mechanisms discussed in this disclosure. For example, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, and/or the one or more transceiver **220**, implements mechanisms for the RAN support of network slicing. According to some aspects of this disclosure, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, may determine supported PLMNs for the cell **103** of the base station **101**. The processor **210**, alone or in combination with computer instructions stored within the memory **250**, may generate a message including PLMN information for the cell **103**. For

example, the message may be an SIB1 message. In some aspects, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, may determine network slices supported in the cell **103** of the base station **101** for each of the PLMNs. In some aspects, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, may generate the message including network slice information per PLMN for the cell **103** of the base station **101**. For example, the message may be the SIB1 message.

According to some aspects of this disclosure, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, may determine supported PLMNs for neighboring cells, such as the cell **111** of the base station **109** and the cell **115** of the base station **113**. The processor **210**, alone or in combination with computer instructions stored within the memory **250**, may generate a second message including PLMNs information for the cell **111** and the cell **115**. For example, the second message may be an SIB4 message. In some aspects, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, may determine network slices supported in the neighboring cells, such as the cell **111** and the cell **115**, for each of the PLMNs. In some aspects, the processor **210**, alone or in combination with computer instructions stored within the memory **250**, may generate the second message including network slice information per PLMN for the cell **111** and the cell **115**. For example, the message may be the SIB4 message.

As discussed in more detail below with respect to FIGS. **3-9**, processor **210** may implement different mechanisms for the RAN support of network slicing as discussed with respect to the system **100** of FIG. **1**.

FIG. **3** illustrates an example of cell distribution. Example system **300** is provided for the purpose of illustration only and does not limit the disclosed aspects. System **300** may include, but is not limited to, a cell **302**, a cell **304**, and a cell **306**. The cell **302** and the cell **304** may support the PLMN 1 and the PLMN 2. In contrast, the cell **306** may support the PLMN 2. The cell **302** and the cell **304** may partially overlap and may operate on a frequency F1. The cell **306** may be within the range of the cell **302** and may operate on a frequency F2.

According to some aspects, the UE **105** may determine to connect to a cell that operates on the frequency F1 when performing a cell reselection. Because both the cell **302** and the cell **304** operate on the frequency F1, the UE **105** may compare signal strength of the cell **302** and the cell **304** and connect to a cell having a higher signal strength. For example, the UE **105** may determine that signals receive from the cell **302** has a higher signal strength and connect to the cell **302**. In some aspects, the UE **105** may locate in an intersection area of the cell **302** and the cell **304**, the signal strength of the cell **302** and the cell **304** may be similar. In such a case, the UE **105** may connect to either the cell **302** or the cell **304**.

According to some aspects, the UE **105** may have the PLMN 2 as its serving operator and may connect to the cell **306**. The UE **105** may move away from the cell **306** and closer to the cell **304**. The UE **105** may determine that the signal strength of the cell **304** is stronger than the signal strength of the cell **306**. Because the serving operating of the UE **105** is the PLMN 2, the UE **105** may determine whether the cell **304** support the PLMN 2. In some aspects, the UE **105** may receive system information from the cell **304** and determine that the cell **304** supports the PLMN 2. For example, the UE **105** may receive an SIB1 message from the cell **304** on the frequency F1 and determine that the cell **304** supports the PLMN 2 at least based on the SIB1 message. In some aspects, the UE **105** may receive system information regarding neighboring cells from the cell **306** and determine that the cell **304** support the PLMN 2. For example, the UE **105** may receive an SIB4 message from the cell **306** and determines that the cell **304** supports the PLMN 2 at least based on the SIB4 message.

FIG. **4** illustrates an example of neighboring cells information. According to some aspects, the neighboring cells information **400** may also be referred to as neighboring cells system information, a per-PLMN cell reselection data, or an SIB4 message. The neighboring cells information **400** may include, but is not limited to, PLMN 1 data **402**, PLMN 2 data **404**, PLMN 3 data **406**, and PLMN 4 data **408**. In some aspects, the PLMN 1 data **402** may include a PLMN identity index **410** and a cell list **412**. The PLMN identity index **410** may be a sequence of digits identifying the PLMN 1. For example, the PLMN identity index **410** may be a five-digit or six-digit number corresponding to the PLMN 1. The cell list **412** may include information of cells that support the PLMN 1. The cell list **412** may include, but is not limited to, cell information **414**, **416**, **418**, and **420**. Each of the cell information **414**, **416**, **418**, and **420** may include a frequency associated with one or more cells that support the PLMN 1. For example, the cell information **414** may include a first frequency indicating that cells operating on the first frequency support the PLMN 1. Likewise, the cell information **416** may include a second frequency indicating that cells operating on the second frequency support the PLMN 1. In some aspects, the cell information **414**, **416**, **418** and **420** are ranked at least based on priorities. For example, the cell information **414** may have a highest priority and therefore ranks the highest.

Referring back to FIG. **3**, the UE **105** may receive the neighboring cells information **400** of the cell **306**, to which the UE **105** connects. Because the cell **302** and the cell **304** are neighboring cells of the cell **306**, the neighboring cells information **400** may include information of the cell **302** and the cell **306**. For example, because the cell **302** and the cell **304** both support the PLMN 1, information of the cell **302** and the cell **304** may be in the cell list **412**, which is part of the PLMN 1 data **402**. In some aspects, the cell information **414** of the cell list **412** may include frequency information of the cell **302** and the cell **304**. For example the first frequency in the cell information **414** may be the frequency F1.

According to some aspect, the UE **105** may determine that its serving operator is the PLMN 1, which is not supported in the cell **306**. The UE **105** may detect, at least based on the neighboring cells information **400** shown in the FIG. **4**, the cell information **414** that indicates the frequency information of the cells supporting the PLMN 1. For example, the UE **105** may determine at least based on the cell information **414** to connect to the cells operating on the first frequency. The UE may determine to connect to the cell **302** that operates on the first frequency. In other aspects, the UE **105** may determine that no cell operating on the first frequency is available. For example, the UE **105** may determine that both the cell **302** and the cell **304** are not available. The UE **105** may detect other cells that support the PLMN 1. For example, the cell information **416** may include a second frequency and indicate that neighboring cells operating on the second frequency support the PLMN 1. The UE **105** may determine to connect to the neighboring cells on the second frequency at least based on the cell information **416**.

FIG. **5** illustrates an example of cell distribution with network slices. Example system **500** is provided for the purpose of illustration only and does not limit the disclosed aspects. System **500** may include, but is not limited to, a cell **502**, a cell **504**, a cell **506**, a cell **508**, and a cell **510**. The cell **502** and the cell **504** may operate on a frequency F1 and support the PLMN 1 and the PLMN 2. The cell **506** and the cell **508** may operate on a frequency F2 and support the PLMN 2. The cell **510** may operate on a frequency F3 and support the PLMN 1. The cell **502** and the cell **504** may support a network slice 1 for the PLMN 1 and the PLMN 2. For example, when connecting to the cell **502** and **504**, the UE **105** may access the network slice 1 if the serving operator of the UE **105** is the PLMN 1 or the PLMN 2. The cell **502** and the cell **504** may support a network slice 2 for the PLMN 1. For example, when connecting to the cells **502** or **504**, the UE **105** may access the network slice 2 if the serving operator of the UE **105** is the PLMN 1. In contrast, the UE **105** may not have an access to the network slice 2 in the cell **502** or the cell **504** if the serving operator of the UE **105** is the PLMN 2.

According to some aspects, the UE **105** of the PLMN 2 may connect to the cell **502**. The UE **105** may receive system information from the cell **502** regarding the neighboring cells. For example, the UE **105** may receive an SIB4 message from the cell **502**. The SIB4 message may include cell information corresponding a network slice for each PLMN. The SIB4 message may indicate that cells operating on the frequency F2 have higher priorities for the network slice 2 service if the operator of the UE **105** is the PLMN 2. Because the UE **105** currently connects to the cell **502**, which operates on the frequency F1, if the UE **105** requires the network slice 2 service, the UE **105** may perform a cell reselection and connect to the cell **506** or the cell **504**.

According to some aspects, the operator of the UE **105** may be the PLMN 1 and the UE **105** connects to the cell **502**. The UE **105** may require the network slice 2 service. The UE **105** may determine, at least based on the SIB4 message received from the cell **502**, that the cells operate on the frequency F3 have higher priorities for the network slice 2. The UE **105** may perform a cell reselection and connect to the cell **510**, which operates on the frequency F3. In other aspects, the UE **105** may determine, at least based on the SIB4 message received from the cell **502**, that the cells operate on the frequency F1 have higher priorities for the network slice 2. The UE **105** may remain connected to the cell **502**, which operates on the frequency F1.

As shown in the FIG. **5**, the cell **502**, **504**, and **510** all support the network slice 2 for the PLMN 1. In some aspects, the cell **510** has a higher priority because the cell **510** is a dedicated cell for the network slice 2. In contrast, the cell **502** and **504** support both of the network slice 1 and 2 for the PLMN 1. In some aspects, the cell **510** has the higher priority because the cell **510** is a dedicated cell for the PLMN 1. While the cell **502** and **504** support both the PLMN 1 and the PLMN 2.

According to some aspects, the operator of the UE **105** may be the PLMN 1 or the PLMN 2, and the UE **105** connects to the cell **502**. The UE **105** may require the network slice 1 service. The UE **105** may determine, at least based on the SIB4 message received from the cell **502**, that the cells operate on the frequency F1 have higher priorities for the network slice 1. Because the UE **105** already connects to the cell **502**, which operates on the frequency F1, the UE **105** may stay connected to the cell **502**.

According to some aspects, the operator of the UE **105** may be the PLMN 1 and the UE **105** connects to the cell **510**. The UE **105** may require the network slice 1 service. The UE **105** may determine, at least based on the SIB4 message received from the cell **502**, that the cells operate on the frequency F1 have higher priorities for the network slice 1. The UE **105** may perform a cell reselection and connect to the cell **502** or the cell **504**, which operates on the frequency F.

According to some aspects, the operator of the UE **105** may be the PLMN 1 and the UE **105** connects to the cell **510**. The UE **105** may require the network slice 2 service. The UE **105** may determine, at least based on the SIB4 message received from the cell **510**, that the cells operate on the frequency F3 have higher priorities for the network slice 2. Because the UE **105** already connects to the cell **510**, which operates on the frequency F3, the UE **105** may stay connected to the cell **510**.

FIG. **6** illustrates an example of local cell information. According to some aspects, the local cell information **600** may also be referred to as local cell system information, per PLMN slice information, or an SIB1 message. The local cell information **600** may include, but is not limited to, PLMN 1 data **602**. PLMN 2 data **604**, PLMN 3 data **606**, and PLMN 4 data **608**. In some aspects, the PLMN 1 data **602** may include a PLMN identity index **610** and a single network slice selection identifier (S-NSSAI) list **612**. The PLMN identity index **610** may be a sequence of digits identifying the PLMN 1. For example, the PLMN identity index **610** may be a five-digit or six-digit number corresponding to the PLMN 1. The S-NSSAI list **612** may include information of network slices that are supported by a cell for the PLMN 1. For example, the local cell information **600** may be received by the UE from the cell **502**. The S-NSSAI list **612** may indicate network slices that are supported by the cell **502** for the PLMN 1. The S-NSSAI list **612** may include, but is not limited to, S-NSSAI **614**, **616**, **618**, and **620**. Each of the S-NSSAI **614**, **616**, **618**, and **620** may include a number sequence corresponding to a network slice. For example, the S-NSSAI **614** may include a number sequence corresponding to the network slice 1 and indicate that the network slice 1 is supported by the cell **502** for the PLMN 1.

Referring back to FIG. **5**, the UE **105** of the PLMN 1 may connect to the cell **510** and require an access to the network slice 1. The UE **105** may receive the local cell information **600** from the cell **510** and determines that the cell **510** does not support the network slice 1 for the PLMN 1. In such a case, the UE **105** may perform a cell reselection to connect to the cell **502** or **504**.

FIG. **7** illustrates an example of neighboring cells slices information. According to some aspects, the neighboring cells slices information **700** may also be referred to as neighboring cells slice system information, a per PLMN per slice cell reselection data, or an SIB4 message. The neighboring cells slices information **700** may include, but is not limited to, PLMN 1 data **702**, PLMN 2 data **704**, PLMN 3 data **706**, and PLMN 4 data **708**. In some aspects, the PLMN 1 data **702** may include a PLMN identity index **710**, s-NSSAI information **712**, **714**, and **716**. The PLMN identity index **710** may be a sequence of digits identifying the PLMN 1. For example, the PLMN identity index **710** may be a five-digit or six-digit number corresponding to the PLMN 1. The S-NSSAI information **712** may include information of cells that support a network slice for the PLMN 1. For example, the S-NSSAI **712** may include an S-NSSAI **718** and a cell sub-list **720**. The S-NSSAI **718** may include a number sequence corresponding to a network slice, such as the network slice 2. The cell sub-list **720** may include information of cells that support the network slice 2 for the

PLMN 1. The cell sub-list **720** may include, but is not limited to, cell information **722**, **724**, **726**, and **728**. Each of the cell information **722**, **724**, **726**, and **728** may include a frequency. For example, the cell information **722** may include the frequency F3 indicating that cells operating on the frequency F3 support the network slice 2 for the PLMN 1. In some aspects, the cell information **722**, **724**, **726**, and **728** are ranked at least based on priorities. For example, the cell information **722** may have a highest priority and therefore ranks the highest.

Referring back to FIG. **5**, the UE **105** of the PLMN 1 may connect to the cell **502** and require an access to the network slice 2. The UE **105** may receive the neighboring cells slices information **700** from the cell **502**. First, because the PLMN 1 is the operator of the UE **105**, the UE **105** may determine that the PLMN 1 data **702** is relevant because it includes the PLMN identity index **710** corresponding to the PLMN 1. Second, because the UE **105** requires the access to the network slice 2, the UE **105** may determine that the S-NSSAI information **712** is relevant because it includes the S-NSSAI **718** corresponding to the network slice 2. Third, the UE may determine to connect to cells that operate on the frequency F3 at least based on the cell information **722**, which ranks the highest in the cell sub-list **720** of the S-NSSAI information **712**. For example, the UE may determine to connect to the cell **510** that operates on the frequency F3.

FIG. **8** illustrates an example method **800** for a base station supporting a network slice based cell selection and/or reselection. As a convenience and not a limitation, FIG. **8** may be described with regard to elements of FIGS. **1**, **2**, and **10**. Method **800** may represent the operation of an electronic device (for example, the base stations **101**, **109**, and **113** of FIG. **1**) implementing the RAN support of network slicing. Method **800** may also be performed by system **200** of FIG. **2** and/or computer system **1000** of FIG. **10**. But method **800** is not limited to the specific aspects depicted in those figures and other systems may be used to perform the method, as will be understood by those skilled in the art. It is to be appreciated that not all operations may be needed, and the operations may not be performed in the same order as shown in FIG. **8**.

At **802**, a base station receives first information. The base station may receive the first information from a core network or one or more neighboring base stations. According to some aspects, the first information may include supported PLMN(s) in a local cell. For example, the base station **101** may receive the first information regarding supported PLMN(s) in the cell **103**. The first information may indicate that the cell **103** supports a PLMN 1 and a PLMN 2. In some aspects, the base station may support one or more local cells. The first information may include supported PLMN(s) in each of the one or more local cells.

According to some aspects, the first information may include supported network slices in the local cell for PLMN(s). For example, the base station may receive the first information that indicates the cell **502** supports the network slice 2 for the PLMN 1 and supports the network slice 1 for the PLMN 1 and the PLMN 2. In some aspects, a plurality of cells may share the base station. For example, the cell **502** and the cell **506** may share the base station. The first information received by the base station may include network slice information of the cell **502** and the cell **506**. For example, the first information may also indicate that the cell **506** supports the network slice 2 for the PLMN 2.

At **804**, the base station may generate a first message at least based on the first information. According to some aspects, the first message may include supported PLMN(s) in the local cell. For example, the base station may be the base station **101** and the first message may indicate that the cell **103** supports the PLMN 1 and the PLMN 2. In some aspects, the base station may support one or more local cells. The first message may include supported PLMN(s) in each of the one or more local cells. In other aspects, the first message may include supported PLMN(s) in one of the one or more local cells.

According to some aspects, the first message may be the local cell information **600** or the SIB1 message **600**. As shown in FIG. **6**, the first message may include available network slices in the local cell for each PLMN. In some aspects, the base station may support one or more cells. For example, the base station may support both the cell **502** and the cell **506**. The first message may include information of both the cell **502** and the cell **506**. In other aspects, the base station may determine that the first message is intended to be transmitted to one or more UEs in the cell **502**. In such as case, the first message may include information of the cell **502**.

At **806**, the base station may receive second information. The base station may receive the second information from a core network or one or more neighboring base stations. The second information may include supported PLMN(s) in neighboring cells. For example, the base station **101** may receive the second information that indicates supported PLMN(s) for the cell **115** and the cell **111**.

According to some aspects, the second information may include supported PLMN(s) and corresponding network slices in neighboring cells. For example, the base station may support the cell **502** and the neighboring cells including the cells **504**, **506**, and **510**. The second information may indicate that the cells **506** and **508** support the network slice 2 for the PLMN 2 and the cell **510** supports the network slice 2 for the PLMN 1.

At **808**, the base station may generate a second message at least based on the second information. In some aspects, the second message may be the neighboring cells information **400** or the SIB4 message **400** shown in the FIG. **4**. In other aspects, the second message may be the neighboring cells slices information **700** or the SIB4 message **700** shown in the FIG. **7**.

At **810**, the base station may transmit the first and the second message to a UE. According to some aspect, the base station may transmit the first and the second message to the UE that connects to the base station. For example, the base station **101** may transmit the first and the second message to the UE **105** via the link **107**. In other aspects, the base station may broadcast the first and the second message to one or more UEs. For example, a base station of the cell **502** may broadcast the first and the second message in the frequency F1 to the one or more UEs.

FIG. **9** illustrates an example method **90** for a UE performing a network slice based cell selection and/or reselection. As a convenience and not a limitation, FIG. **9** may be described with regard to elements of FIGS. **1**, **2**, and **10**. Method **900** may represent the operation of an electronic device (for example, the UE **105** of FIG. **1**) implementing RAN support of network slicing. Method **900** may also be performed by system **200** of FIG. **2** and/or computer system **1000** of FIG. **10**. But method **900** is not limited to the specific aspects depicted in those figures and other systems may be used to perform the method, as will be understood by those skilled in the art. It is to be appreciated that not all operations may be needed, and the operations may not be performed in the same order as shown in FIG. **9**.

At **902**, the UE may determine a serving operator of the UE. In some aspects, the UE may determine its serving operator at least based on an IMSI of the UE. For example, the UE may determine the serving operator to be the PLMN 1. According to some aspects, the UE may include a subscriber identity module (SIM) card that stores the IMSI. The UE may obtain the IMSI by reading the SIM card.

At **904**, the UE may determine a network slice of interest to the UE. According to some aspects, the UE may determine the network slice of interest based on a QoS requirement of the UE. For example, the UE may require a reliable and low latency service, such as a URLLC service. The UE may determine that a network slice providing URLLC service to be the network slice of interest. In some aspect, the UE may determine the network slice of interest based on a user input or a request from one or more applications of the UE.

At **906**, the UE receives a first message and a second message. According to some aspects, the first message and the second message may correspond to the first message and the second message described in FIG. **8**. For example, the first message and the second message may correspond to an SIB1 message and an SIB4 message, respectively. In some aspects, the UE may receive the first and the second message from a current connecting cell via a base station. For example, the UE **105** may receive the first and the second message from the cell **103** via the base station **101**.

At **908**, the UE may determine whether the network slice of interest is supported in the current connecting cell. According to some aspects, the UE may determine at least based on the first message, such as the SIB1 message **600** described in FIG. **6**. The UE **105** may determine that the PLMN 1 data **602** is relevant based on the PLMN identity index **610**. The UE may check the S-NSSAI list **612** of the PLMN 1 data **602** and determine if the network slice of interest is in the S-NSSAI list **612**. If the network slice of interest is in the S-NSSAI list **612**, the control moves to **910**.

At **910**, the UE may send an access request for the network slice of interest. According to some aspects, the UE may send the access request to the current connecting cell. For example, the UE **105** may send the access request to the cell **103** via the base station **101**.

Referring back to **908**, if the network slice of interest is not in the S-NSSAI list **612**, the control moves to **912**.

At **912**, the UE may determine whether the network slice of interest is supported in at least one neighboring cell. According to some aspects, the UE may determine at least based on the second message. For example, the UE **105** may determine at least based on the SIB4 message **700** described in FIG. **7**. The UE **105** may determine that the PLMN 1 data **702** is relevant based on the PLMN identity index **710**. For example, the PLMN identity index **710** may correspond to the PLMN 1. The UE may determine that the S-NSSAI information **712** is relevant based on the S-NSSAI **718** because the S-NSSAI **718** may correspond to the network slice of interest. If the cell sub-list **720** include at least one cell information data, for example, the cell information **722**, the UE may determine that the network slice is supported in at least one neighboring cell. The control moves to **914**.

At **914**, if the cell sub-list **720** includes more than one cell information data, the UE determines to use cell information data based on its rank. For example, the UE determines to use a highest ranked cell information data, such as the cell information **722**. In some aspects, the cell information data in the cell sub-list **720** may be ranked based on priorities. For example, each of the cell information in the cell sub-list may include a priority value. The cell information **722** may include a first priority value. The UE may determine that the cell information **722** ranks the highest because the first priority value may is larger than priority values of any other cell information data in the cell sub-list **720**.

According to some aspects, the cell information **722** may also include a frequency. The UE may determines, at least based on the cell information **722**, that neighboring cells operating on the frequency support the network slice of interest for the PLMN 1.

At **916**, the UE may establish communication with a neighboring cell operating on the frequency. According to some aspects, the UE may transmit a connection request to the neighboring cell on the frequency to establish the communication. In some aspects, the UE may determine that more than one neighboring cells operate on the frequency. The UE may establish communication with a neighboring cell with a highest signal strength or a best channel quality.

Referring back to **912**, the UE may determine that no neighboring cell supports the network slice of interest for the PLMN 1. For example, the UE may determine that the cell sub-list **720** is empty. Alternatively, the UE may determine that the S-NSSAI information **712**, **714**, and **716** do not correspond to the network slice of interest. For example, the UE may determine that the S-NSSAI **718** does not match the network slice of interest. In such a case, the control moves to **918**.

At **918**, the UE determines whether to consider cells that do not support the network slice of interest. The UE may determine at least based on control signals received from the base station or the core network. The UE may also determine based on a user input or a request from one or more applications of the UE. If the UE determines not to consider the cells that do not support the network slice of interest, the control moves to **920**.

At **920**, the UE may connect to a cell that supports a default network slice for the PLMN 1. According to some aspect, the default network slice may provide basic communication services to the UE. For example, the basic communication services may include, but are not limited to, voice/video communications, upload/download files, and web browsing. In some aspects, the default network slice provides eMBB service and the network slice of interest may provide URLLC service.

Referring back to **918**, if the UE determines to consider the cells that do not support the network of interest, the control moves to **922**.

At **922**, the UE may camp on a first neighboring cell. In some aspects, the UE may access the default network slice when camping on the first neighboring cell. The UE may determine to camp on the first neighboring cell based on a signal strength of the neighboring cell. For example, the signal strength of the first neighboring cell may be larger than any other neighboring cells. In some aspects, the signal strength of the first neighboring cell may be lower than a threshold. The threshold may be used to prevent the UE from connecting to a neighboring cell that locates too close to the current connecting cell. In other aspects, the UE may determine to camp on the first neighboring cell based on a channel quality.

At **924**, the UE may initiate a cell reselection based on the SIB4 message **700** receive from the first neighboring cell. According to some aspects, the UE may receive an SIB4 message **700** from the first neighboring cell when camping on the neighboring cell. In some aspects, the UE may also receive an SIB1 message **600** from the first neighboring cell.

At **926**, the UE may determine whether at least one neighboring cell of the first neighboring cell support the

network of interest for the PLMN 1 based on the SIB4 message **700** received from the first neighboring cell. According to some aspects, the neighboring cells described in **912** may be different from neighboring cells of the first neighboring cell. The neighboring cells described in **912** are close to the current connecting cell. In contrast, the neighboring cells of the first neighboring cell are close to the first neighboring cell. Because geolocations of the current connecting cell and the first neighboring cell may be different, the neighboring cells described in **912** may be different from the neighboring cells of the first neighboring cell.

Similar to **912**, the UE may determine that at least one neighboring cell of the first neighboring cell support the network slice of interest, the control moves to **928**.

At **928**, the UE may establish communication with the at least on neighboring cell of the first neighboring cell. If more than one neighboring cells of the first neighboring cell supports the network slice of interest, the UE select one neighboring cell to connect as described in **914** and **916**.

Referring back to **926**, if the UE determines that no neighboring cell of the first neighboring cell supports the network slice of interest for the PLMN 1, the control moves to **920**, which is described above. In some aspects, if the UE have access to the default network slice when connecting to the first neighboring cell, the UE may stay connected to the first neighboring cell.

Various aspects may be implemented, for example, using one or more computer systems, such as computer system **1000** shown in FIG. **10**. Computer system **1000** may be any well-known computer capable of performing the functions described herein such as devices **101**, **105** of FIG. **1**, or **200** of FIG. **2**. Computer system **1000** includes one or more processors (also called central processing units, or CPUs), such as a processor **1004**. Processor **1004** is connected to a communication infrastructure **1006** (e.g., a bus.) Computer system **1000** also includes user input/output device(s) **1003**, such as monitors, keyboards, pointing devices, etc., that communicate with communication infrastructure **1006** through user input/output interface(s) **1002**. Computer system **1000** also includes a main or primary memory **1008**, such as random access memory (RAM). Main memory **1008** may include one or more levels of cache. Main memory **1008** has stored therein control logic (e.g., computer software) and/or data.

Computer system **1000** may also include one or more secondary storage devices or memory **1010**. Secondary memory **1010** may include, for example, a hard disk drive **1012** and/or a removable storage device or drive **1014**. Removable storage drive **1014** may be a floppy disk drive, a magnetic tape drive, a compact disk drive, an optical storage device, tape backup device, and/or any other storage device/drive.

Removable storage drive **1014** may interact with a removable storage unit **1018**. Removable storage unit **1018** includes a computer usable or readable storage device having stored thereon computer software (control logic) and/or data. Removable storage unit **1018** may be a floppy disk, magnetic tape, compact disk. DVD, optical storage disk, and/any other computer data storage device. Removable storage drive **1014** reads from and/or writes to removable storage unit **1018** in a well-known manner.

According to some aspects, secondary memory **1010** may include other means, instrumentalities or other approaches for allowing computer programs and/or other instructions and/or data to be accessed by computer system **1000**. Such means, instrumentalities or other approaches may include, for example, a removable storage unit **1022** and an interface **1020**. Examples of the removable storage unit **1022** and the interface **1020** may include a program cartridge and cartridge interface (such as that found in video game devices), a removable memory chip (such as an EPROM or PROM) and associated socket, a memory stick and USB port, a memory card and associated memory card slot, and/or any other removable storage unit and associated interface.

Computer system **1000** may further include a communication or network interface **1024**. Communication interface **1024** enables computer system **1000** to communicate and interact with any combination of remote devices, remote networks, remote entities, etc. (individually and collectively referenced by reference number **1028**). For example, communication interface **1024** may allow computer system **1000** to communicate with remote devices **1028** over communications path **1026**, which may be wired and/or wireless, and which may include any combination of LANs, WANs, the Internet, etc. Control logic and/or data may be transmitted to and from computer system **1000** via communication path **1026**.

The operations in the preceding aspects may be implemented in a wide variety of configurations and architectures. Therefore, some or all of the operations in the preceding aspects may be performed in hardware, in software or both. In some aspects, a tangible, non-transitory apparatus or article of manufacture includes a tangible, non-transitory computer useable or readable medium having control logic (software) stored thereon is also referred to herein as a computer program product or program storage device. This includes, but is not limited to, computer system **1000**, main memory **1008**, secondary memory **1010** and removable storage units **1018** and **1022**, as well as tangible articles of manufacture embodying any combination of the foregoing. Such control logic, when executed by one or more data processing devices (such as computer system **1000**), causes such data processing devices to operate as described herein.

Based on the teachings contained in this disclosure, it will be apparent to persons skilled in the relevant art(s) how to make and use aspects of the disclosure using data processing devices, computer systems and/or computer architectures other than that shown in FIG. **10**. In particular, aspects may operate with software, hardware, and/or operating system implementations other than those described herein.

It is to be appreciated that the Detailed Description section, and not the Summary and Abstract sections, is intended to be used to interpret the claims. The Summary and Abstract sections may set forth one or more, but not all, exemplary aspects of the disclosure as contemplated by the inventor(s), and thus, are not intended to limit the disclosure or the appended claims in any way.

While the disclosure has been described herein with reference to exemplary aspects for exemplary fields and applications, it should be understood that the disclosure is not limited thereto. Other aspects and modifications thereto are possible, and are within the scope and spirit of the disclosure. For example, and without limiting the generality of this paragraph, aspects are not limited to the software, hardware, firmware, and/or entities illustrated in the figures and/or described herein. Further, aspects (whether or not explicitly described herein) have significant utility to fields and applications beyond the examples described herein.

Aspects have been described herein with the aid of functional building blocks illustrating the implementation of specified functions and relationships thereof. The boundaries of these functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternate boundaries can be defined as long as the specified

functions and relationships (or equivalents thereof) are appropriately performed. In addition, alternative aspects may perform functional blocks, steps, operations, methods, etc. using orderings different from those described herein.

References herein to "one embodiment," "an embodiment," "an example embodiment." or similar phrases, indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it would be within the knowledge of persons skilled in the relevant art(s) to incorporate such feature, structure, or characteristic into other aspects whether or not explicitly mentioned or described herein.

The breadth and scope of the disclosure should not be limited by any of the above-described exemplary aspects, but should be defined only in accordance with the following claims and their equivalents.

It is well understood that the use of personally identifiable information should follow privacy policies and practices that are generally recognized as meeting or exceeding industry or governmental requirements for maintaining the privacy of users. In particular, personally identifiable information data should be managed and handled so as to minimize risks of unintentional or unauthorized access or use, and the nature of authorized use should be clearly indicated to users.

EXAMPLES

Example 1 may include a base station apparatus configured to support with a cell, comprising:

a transceiver configured to communicate with a user equipment (UE); and

a processor communicatively, coupled to the transceiver, and configured to:

generate a first message;

generate a second message; and

transmit, using the transceiver, the first message and the second message to the UE,

wherein the first message is associated with the cell and includes a first public land mobile network (PLMN) identity index and a first list of one or more network slices supported by a first PLMN associated with the first PLMN identity index,

wherein the second message is associated with one or more neighboring cells, and includes the first PLMN identity index and a second list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells, and

wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data.

Example 2 may include the base station of example 1 or some other example herein, wherein the first message is a system information block type 1 (SIB1) message.

Example 3 may include the base station of example 1 or some other example herein, wherein the second message is a system information block type 4 (SIB4) message.

Example 4 may include the base station of example 1 or some other example herein, wherein the first list includes single network slice selection assistance information (S-NSSAI) for each of the one or more network slices in the first list.

Example 5 may include the base station of example 1 or some other example herein, wherein each of the one or more network slice data in the second list further includes single network slice selection assistance information (S-NSSAI).

Example 6 may include the base station of example 1 or some other example herein, wherein each of the one or more neighboring cell data includes frequency information.

Example 7 may include the base station of example 1 or some other example herein, wherein the one or more neighboring cell data are ranked in the sub-list according to corresponding priorities.

Example 8 may include the base station of example 1 or some other example herein, wherein the first message further includes a second PLMN identity index and a third list of one or more network slices, wherein the first PLMN supports the one or more network slices in the first list, and wherein a second PLMN associated with the second PLMN identity index supports the one or more network slices in the third list.

Example 9 may include the base station of example 1 or some other example herein, wherein the second message includes a second PLMN identity index and a fourth list of one or more network slice data, wherein the first PLMN supports the one or more network slices in the second list, and wherein a second PLMN associated with the second PLMN identity index supports the one or more network slices in the fourth list.

Example 10 may include a method. The method comprises:

generating, by a base station, a first message;

generating, by the base station, a second message; and

transmitting, by the base station, the first message and the second message to a user equipment (UE),

wherein the first message is associated with a cell supported by the base station and includes a first public land mobile network (PLMN) identity index and a first list of one or more network slices,

wherein the second message is associated with one or more neighboring cells and includes the first PLMN identity index and a second list of one or more network slice data, and

wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data

Example 11 may include the method of example 10 or some other example herein, wherein the first message is a system information block type 1 (SIB1) message.

Example 12 may include the method of example 10 or some other example herein, wherein the second message is a system information block type 4 (SIB4) message.

Example 13 may include the method of example 10 or some other example herein, wherein the first list includes single network slice selection assistance information (S-NSSAI) for each of the one or more network slices.

Example 14 may include the method of example 10 or some other example herein, wherein each of the one or more network slice data in the second list further includes single network slice selection assistance information (S-NSSAI).

Example 15 may include the method of example 10 or some other example herein, wherein each of the one or more neighboring cell data includes frequency information.

Example 16 may include the method of example 10 or some other example herein, wherein the one or more neighboring cell data are ranked in the sub-list according to corresponding priorities.

Example 17 may include the method of example 10 or some other example herein, wherein the first message further includes a second PLMN identity index and a third list of one or more network slices, wherein the a first PLMN

associated with the first PLMN identity index supports the one or more network slices in the first list, and wherein a second PLMN associated with the second PLMN identity index supports the one or more network slices in the third list.

Example 18 may include the method of example 10 or some other example herein, wherein the second message includes a second PLMN identity index and a fourth list of one or more network slice data, wherein a first PLMN associated with the first PLMN identity index supports the one or more network slices in the second list, and wherein the second PLMN associated with the second PLMN identity index supports the one or more network slices in the fourth list.

Example 19 may include a user equipment (UE), comprising:

a transceiver configured to communicate with a base station; and

a processor communicatively coupled to the transceiver and configured to:

determine a public land mobile network (PLMN) serving the UE;

determine a network slice of interest;

receive, using the transceiver, a first message and a second message, wherein the first message is associated with a cell and includes a public land mobile network (PLMN) identity index associated with a PLMN and a first list of one or more network slices, wherein the second message is associated with one or more neighboring cells and includes the PLMN identity index, a second list of one or more network slice data, and wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data;

determine at least based on the first message that the network slice of interest is not supported by the PLMN in the cell;

determine at least based on the second message, neighboring cell data associated with the network slice of interest and the PLMN;

establish, using the transceiver, a communication link with a neighboring cell of the one or more neighboring cells at least based on the neighboring cell data; and

transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest.

Example 20 may include the UE of example 19 or some other example herein, wherein the first message is a system information block type 1 (SIB1) message.

Example 21 may include the UE of example 19 or some other example herein, wherein the second message is a system information block type 4 (SIB4) message.

Example 22 may include the UE of example 19 or some other example herein, wherein the processor is further configured to determine at least based on the first message that the network slice of interest is not supported by determining that the network slice of interest is not in the first list of one or more network slices.

Example 23 may include the UE of example 19 or some other example herein, wherein the processor is further configured to determine at least based on the second message the neighboring cell data associated with the network slice of interest and the PLMN by: determining that the PLMN identity index corresponds to the PLMN; determining that the at least one of the one or more network slice data includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest, and determining that the neighboring cell data is in the sub-list.

Example 24 may include the UE of example 23 or some other example herein, wherein the processor is further configured to determine at least based on the second message the neighboring cell data associated with the network slice of interest and the PLMN by determining that the neighboring cell data ranks the highest in the sub-list at least based on priorities of the one or more neighboring cell data in the sub-list.

Example 25 may include the UE of example 19 or some other example herein, wherein the processor is further configured to establishing the communication link with the neighboring cell by communicating with the neighboring cell at least based on frequency information of the neighboring cell data.

Example 26 may include the UE of example 19 or some other example herein, wherein the request includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest.

Example 27 may include a method comprising:

determining, by a user equipment (UE), a public land mobile network (PLMN) serving the UE, wherein the UE connects to a cell;

determining, by the UE, an network slice of interest;

receiving, by the UE, a first message and a second message, wherein the first message is associated with the cell and includes a public land mobile network (PLMN) identity index and a first list of one or more network slices, wherein the second message is associated with one or more neighboring cells and includes the PLMN identity index, a second list of one or more network slice data, and wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data;

determining, by the UE, at least based on the first message that the network slice of interest is not supported by the PLMN in the cell;

determining, by the UE, at least based on the second message, neighboring cell data associated with the network slice of interest and the PLMN;

establishing, by the UE, a communication link with a neighboring cell of the one or more neighboring cells at least based on the neighboring cell data; and

transmitting, by the UE, a request to the neighboring cell to access the network slice of interest.

Example 28 may include the method of example 27 or some other example herein, wherein the first message is a system information block type 1 (SIB1) message.

Example 29 may include the method of example 27 or some other example herein, wherein the second message is a system information block type 4 (SIB4) message.

Example 30 may include the method of example 27 or some other example herein, wherein determining at least based on the first message that the network slice of interest is not supported further comprising determining that the network slice of interest is not in the first list of one or more network slices.

Example 31 may include the method of example 27 or some other example herein, wherein determining at least based on the second message the neighboring cell data associated with the network slice of interest and the PLMN further comprising: determining that the PLMN identity index corresponds to the PLMN; determining that the at least one of the one or more network slice data includes single network slice selection assistance information (S-NS-

SAI) corresponding to the network slice of interest, and determining that the neighboring cell data is in the sub-list.

Example 32 may include the method of example 31 or some other example herein, wherein determining at least based on the second message the neighboring cell data associated with the network slice of interest and the PLMN further comprising determining that the neighboring cell data ranks the highest in the sub-list at least based on priorities of the one or more neighboring cell data in the sub-list.

Example 33 may include the method of example 27 or some other example herein, wherein establishing the communication link with the neighboring cell comprising communicating with the neighboring cell at least based on frequency information of the neighboring cell data.

Example 34 may include the method of example 27 or some other example herein, wherein the request includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest.

Example 35 may include a user equipment (UE), comprising:

a transceiver configured to communicate with a base station; and

a processor communicatively coupled to the transceiver and configured to:

determine a public land mobile network (PLMN) serving the UE;

determine a network slice of interest;

receive, using the transceiver, a first message wherein the first message is associated with a cell and includes a public land mobile network (PLMN) identity index associated with the PLMN and a first list of one or more network slices;

determine at least based on the first message that the network slice of interest is not supported by the PLMN in the cell;

receive, using the transceiver, a second message, wherein the second message is associated with a neighboring cell and includes the public land mobile network (PLMN) identity index associated with the PLMN and a second list of one or more network slices;

determine at least based on the second message, the second list of one or more network slices includes the network slice of interest;

establish, using the transceiver, a communication link with the neighboring cell; and

transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest.

Example 36 may include the UE of example 35 or some other example herein, wherein the first message is a system information block type 1 (SIB1) message.

Example 37 may include the UE of example 35 or some other example herein, wherein the second message is a system information block type 1 (SIB1) message.

Example 38 may include the UE of example 35 or some other example herein, wherein the processor is further configured to determine at least based on the first message that the network slice of interest is not supported by determining that the network slice of interest is not in the first list of one or more network slices.

Example 39 may include the UE of example 35 or some other example herein, wherein the request includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest.

Example 40 may include a base station apparatus configured to support with a cell, comprising:

a transceiver configured to communicate with a user equipment (UE); and

a processor communicatively, coupled to the transceiver, and configured to:

generate a first message;

transmit, using the transceiver, the first message to the UE,

wherein the first message is associated with one or more neighboring cells, and includes the first PLMN identity index and a second list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells, and

wherein at least one of the one or more network slice data in the second list includes a sub-list of one or more neighboring cell data.

Example 41 may include the base station of example 40 or some other example herein, wherein the processor is further configured to:

generate a second message; and

transmit, using the transceiver, the second message to the UE,

wherein the second message is associated with the cell and includes a first public land mobile network (PLMN) identity index and a first list of one or more network slices supported by a first PLMN associated with the first PLMN identity index.

Example 42 may include a user equipment (UE), comprising:

a transceiver configured to communicate with a base station; and

a processor communicatively coupled to the transceiver and configured to:

determine a public land mobile network (PLMN) serving the UE;

determine a network slice of interest;

receive, using the transceiver, a first message wherein the first message is associated with one or more neighboring cells and includes the PLMN identity index, a first list of one or more network slice data, and wherein at least one of the one or more network slice data in the first list includes a sub-list of one or more neighboring cell data;

determine at least based on the first message that at least one neighboring cell of the one or more neighboring cells is preferred for the network slice of interest for the PLMN;

establish, using the transceiver, a communication link with the neighboring cell; and

transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest.

Example 43 may include the UE of example 42 or some other example herein, wherein the processor is further configured to determine at least based on the first message that the at least one neighboring cell of the one or more neighboring cells is preferred for the network slice of interest for the PLMN by:

determining that the PLMN identity index corresponds to the PLMN;

determining that the at least one of the one or more network slice data includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest, and

determining that the at least one neighboring cell is in the sub-list

determining that the at least one neighboring cell ranks the highest in the sub-list based on priorities.

Example 44 may include a user equipment (UE), comprising:

a transceiver configured to communicate with a base station; and

a processor communicatively coupled to the transceiver and configured to:

determine a public land mobile network (PLMN) serving the UE;

determine a network slice of interest;

receive, using the transceiver, a first message wherein the first message is associated with one or more neighboring cells and includes a PLMN identity index, a first list of one or more network slice data, and wherein at least one of the one or more network slice data in the first list includes a sub-list of one or more neighboring cell data;

determine at least based on the first message that at least one neighboring cell of the one or more neighboring cells is preferred for the network slice of interest for the PLMN;

establish, using the transceiver, a communication link with the neighboring cell; and

transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest.

Example 45 may include the UE of example 43 or some other example herein, wherein the processor is further configured to determine at least based on the first message that the at least one neighboring cell of the one or more neighboring cells is preferred for the network slice of interest for the PLMN by:

determining that the PLMN identity index corresponds to the PLMN;

determining that the at least one of the one or more network slice data includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest, and

determining that the at least one neighboring cell is in the sub-list

determining that the at least one neighboring cell ranks the highest in the sub-list based on priorities.

Example 46 may include the UE of example 43 or some other example herein, wherein the processor is further configured to:

receive, using the transceiver, a second message, wherein the second message is associated with a cell and includes the public land mobile network (PLMN) identity index associated with the PLMN and a second list of one or more network slices; and

determine at least based on the second message that the network slice of interest is not supported by the PLMN in the cell.

Example 47 may include the UE of example 46 or some other example herein, wherein the processor is further configured to determine at least based on the second message that the network slice of interest is not supported by determining that the network slice of interest is not in the second list of one or more network slices.

Example 48 may include the UE of example 46 or some other example herein, wherein the first message is a system information block type 4 (SIB4) message, and wherein the second message is a system information block type 1 (SIB1) message.

What is claimed is:

1. A base station apparatus configured to support wireless communication within a cell, comprising:

a transceiver configured to enable wireless communication with a user equipment (UE); and

a processor, communicatively coupled to the transceiver, and configured to:

generate a first message; and

transmit, using the transceiver, the first message to the UE,

wherein the first message includes a first public land mobile network (PLMN) identity index corresponding to a first PLMN supported by the cell, and a first list of one or more network slices supported by the first PLMN,

wherein the first message further includes a second PLMN identity index and a second list of one or more network slices,

wherein the first PLMN supports the one or more network slices in the first list, and

wherein a second PLMN associated with the second PLMN identity index supports the one or more network slices in the second list.

2. The base station apparatus of claim **1**, wherein the processor is further configured to:

generate a second message; and

transmit, using the transceiver, the second message to the UE,

wherein the second message is associated with one or more neighboring cells, and includes the first PLMN identity index and a third list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells, and

wherein at least one of the one or more network slice data in the third list includes a sub-list of one or more neighboring cell data.

3. The base station apparatus of claim **1**, wherein the first message is a system information block type 1 (SIB1) message, and wherein the first list includes single network slice selection assistance information (S-NSSAI) for each of the one or more network slices in the first list.

4. The base station apparatus of claim **2**, wherein the second message is a system information block type 4 (SIB4) message, and wherein each of the one or more network slice data in the second third list further includes single network slice selection assistance information (S-NSSAI).

5. The base station apparatus of claim **2**, wherein each of the one or more neighboring cell data includes frequency information, and wherein the one or more neighboring cell data are ranked in the sub-list according to corresponding priorities.

6. The base station apparatus of claim **2**,

wherein the second message includes a third PLMN identity index and a fourth list of one or more network slice data,

wherein the first PLMN supports the one or more network slices in the third list, and

wherein a third PLMN associated with the third PLMN identity index supports the one or more network slices in the fourth list.

7. A user equipment (UE), comprising:

a transceiver configured to enable wireless communication with a base station; and

a processor, communicatively coupled to the transceiver, and configured to:

determine a public land mobile network (PLMN) serving the UE via a cell associated with the base station;

determine a network slice of interest to the UE;

receive, using the transceiver, a first message that includes a PLMN identity index corresponding to the PLMN and a first list of one or more network slices supported by the PLMN; and

determine, based at least on the first message, that the network slice of interest is not supported by the PLMN in the cell;

receive, using the transceiver, a second message, wherein the second message is associated with a neighboring cell and includes the PLMN identity index corresponding to the PLMN and a second list of one or more network slices supported by the PLMN in the neighboring cell;

determine, based at least on the second message, that the network slice of interest is supported by the PLMN in the neighboring cell;

establish, using the transceiver, a communication link with the neighboring cell; and

transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest.

8. The UE of claim **7**, wherein the first message is a system information block type **1** (SIB**1**) message, and wherein the second message is a SIB1 message.

9. The UE of claim **7**, wherein the processor is further configured to determine at least based on the first message that the network slice of interest is not supported by determining that the network slice of interest is not in the first list of one or more network slices.

10. A base station apparatus configured to support wireless communication within a cell, comprising:

a transceiver configured to enable wireless communication with a user equipment (UE); and

a processor, communicatively coupled to the transceiver, and configured to:

generate a first message; and

transmit, using the transceiver, the first message to the UE,

wherein the first message is associated with one or more neighboring cells, and includes a first public land mobile network (PLMN) identity index corresponding to a first PLMN and a first list of one or more network slice data associated the first PLMN as supported by the one or more neighboring cells, and

wherein at least one of the one or more network slice data in the first list includes a sub-list of one or more neighboring cell data, and

wherein each of the one or more neighboring cell data includes frequency information, and wherein the one or more neighboring cell data are ranked in the sub-list according to corresponding priorities.

11. The base station apparatus of claim **10**, wherein the processor is further configured to:

generate a second message; and

transmit, using the transceiver, the second message to the UE,

wherein the second message is associated with the cell and includes the first PLMN identity index and a second list of one or more network slices supported by the first PLMN.

12. The base station apparatus of claim **11**, wherein the second message is a system information block type 1 (SIB1) message, and wherein the second list includes single network slice selection assistance information (S-NSSAI) for each of the one or more network slices in the second list.

13. The base station apparatus of claim **10**, wherein the first message is a system information block type 4 (SIB4) message, and wherein each of the one or more network slice data in the first list further includes single network slice selection assistance information (S-NSSAI).

14. A user equipment (UE), comprising:

a transceiver configured to enable wireless communication with a base station; and

a processor, communicatively coupled to the transceiver, and configured to:

determine a public land mobile network (PLMN) serving the UE;

determine a network slice of interest to the UE;

receive, using the transceiver, a first message wherein the first message is associated with one or more neighboring cells and includes a PLMN identity index, a first list of one or more network slice data, and wherein at least one of the one or more network slice data in the first list includes a sub-list of one or more neighboring cell data;

determine, based at least on the first message, that a neighboring cell of the one or more neighboring cells is preferred for the network slice of interest for the PLMN;

establish, using the transceiver, a communication link with the neighboring cell;

transmit, using the transceiver, a request to the neighboring cell to access the network slice of interest;

receive, using the transceiver, a second message, wherein the second message is associated with a cell that serves the UE and includes the PLMN identity index corresponding to the PLMN and a second list of one or more network slices; and

determine, based at least on the second message, that the network slice of interest is not supported by the PLMN in the cell.

15. The UE of claim **14**, wherein the processor is further configured to:

determine that the PLMN identity index corresponds to the PLMN;

determine that the at least one of the one or more network slice data includes single network slice selection assistance information (S-NSSAI) corresponding to the network slice of interest;

determine that the neighboring cell is in the sub-list; and

determine that the neighboring cell is preferred based on a corresponding priority rank in the sub-list for the neighboring cell.

16. The UE of claim **14**, wherein the processor is further configured to determine the network slice of interest is not in the second list of one or more network slices.

17. The UE of claim **14**, wherein the first message is a system information block type 4 (SIB4) message, and wherein the second message is a system information block type 1 (SIB1) message.

18. The base station apparatus of claim **11**,

wherein the second message includes a second PLMN identity index and a third list of one or more network slice data,

wherein the first PLMN supports the one or more network slices in the second list, and

wherein a second PLMN associated with the second PLMN identity index supports the one or more network slices in the third list.

19. The UE of claim **14**, wherein to determine, based at least on the second message, that the network slice of interest is not supported by the PLMN in the cell, the processor is further configured to determine that the network slice of interest is not in the second list of one or more network slices.

20. The UE of claim **14**, wherein the first message is a system information block type 1 (SIB1) message, and wherein the second message is a SIB1 message.

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